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From Photo. by]

FRONTISPIECE.

[James Mitchell.

THE POLLOK WYCH ELMS.



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OF THE

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Society. K

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I.

MEMORIAL NOTICE OF ROBERT TURNER,

PRESIDENT, 1890-92.

(Read 2nd May, 1894.)

By the death of Mr. Robert Turner the Society has to deplore the loss of one who was amongst its earliest and ablest members, who did yeoman service for it, who filled its highest offices in the worthiest manner, and who so recently as 6th December last was added to its short list of honorary members. In the kindly note acknowledging election to this position, written from what turned out to be his death-bed, Mr. Turner expressed the hope that he would still be able to do further work for the Society; but this was not to be, for he passed away on the 20th March last after a prolonged and painful illness, aged 45. Those who had the privilege of visiting him during his long illness, can never forget his resolution, cheerfulness, vivacity and hopefulness in spite of prolonged and acute sufferings.

Robert Turner was a Lanarkshire man, born and brought up on the verge of the Upper Ward, where (to quote his own words written in another connection) "there are ample solitudes of moorland and hill, where wildness is all in all" (*Annals of A. N. S.*, page 1, 1893). Born on 29th December, 1848, at Wide Close, Strathaven, he was educated at Crosshill Parish School there, and at an early age showed those intellectual and scholarly qualities which always distinguished him. When only 15 years old he taught a large country school at Drumclog, lodging in turn with the farmers in the district, thus gaining an early and lasting acquaintance with the country which he loved so well, and making many friendships. He, however, gave up teaching; and

about the year 1865 entered the Custom House, Glasgow, where he remained for about 28 years, attaining the position of Assistant Registrar of Shipping. For more than two years his health had been failing, and last year he resigned his appointment, meaning to reside in retirement at Strathaven, but his continued and aggravated illness never allowed him to leave his house at Hillhead, where he died. He was never married, and his mother, with whom he lived, predeceased him only about two years. His last appearance before our Society, and his last public appearance of any kind, was on 2nd December, 1891, when he delivered a paper on "Trees, Tree-ferns and Palms," which was intended to be followed by a second paper continuing the subject.

Mr. Turner was a man of great culture and refined tastes. His knowledge of nature and of books was profound; his reading was catholic; his information extensive; his memory tenacious; his conversation illuminative; and he had the pen of a ready writer. Richly gifted, accomplished, and well-informed on many subjects, he was pre-eminent in the field of natural science, being indeed, one of the best all-round naturalists known in our city. As a botanist he possessed a practical knowledge of the flowering plants of Great Britain; and, for the purpose of observing and collecting, had visited many parts of the country, from the Channel Islands to Orkney and Shetland. An accomplished geologist, he, one year, carried on the geological classes in Anderson's College with success, in the absence of the lecturer through illness. He also had an acquaintance with other branches of natural science, and was at the same time possessed of great literary taste and ability. Sociable and companionable in nature and in pursuit of his favourite studies, Mr. Turner was a prominent member of several local societies, and a contributor to their work. In 1877 he was a member of the Glasgow Society of Field Naturalists, afterwards amalgamated with the Natural History Society of Glasgow. In the latter Society he repeatedly filled the position of Vice-President and other offices, and contributed papers to its proceedings. He was also a member of the Cryptogamic Society of Scotland, and acted as general secretary when this Society held its show in Glasgow in 1880, and at its meeting in Dumfries, in 1883, he read a paper on "Milldew;" also of the Geological Society of Glasgow; Dumfriesshire and Galloway Natural History

and Antiquarian Society (honorary); and the Pen and Pencil Club. His connection with our Society dates from 1886, the second year of its existence, and he was Vice-President for two years (1888-90), and President for other two years (1890-92). He had not a little to do with the renewed lease of life which the Society took in 1888, and full advantage was taken of his capacity and willingness to work for it. This is best shown by the following list of papers which he read :—

- 14th Dec., 1886.—“Pollen.”
- 30th Sept., 1888.—“The Cadzow Herd of White Cattle.”
- 8th Nov., 1888.—“Fossils and Fossilisation.”
- 10th Jan., 1889.—“Secular Procession of Life.”
- 3rd Feb., 1890.—“Land Making and Unmaking.”
- 1st Oct., 1890.—“The Uredineæ and Ustilaginææ.”
- 1st July, 1891.—“Dr. Robert Morison, Aberdonian : a Botanist of Restoration Times.”
- 2nd Dec., 1891.—“Trees, Tree-ferns and Palms” (Limelight illustrations).

He also made, amongst others, the following important exhibits :—

- 14th June, 1888.—“*Primula farinosa*, *P. scotica*, *P. vulgaris*, and *P. veris*.”
- 5th Nov., 1889.—“Plants illustrative of the Flora of the South of England and of the Channel Islands.”
- 3rd March, 1890.—“*Tillandsia usneoides* (with photographs illustrating its modes of growth).”

Those names will bring to the memories of many Members now present recollections of the vivid, eloquent, and informing treatment of these differing subjects by one who touched none of them without adorning it. His presence at excursions of the Society was also much valued, his information being gladly imparted to enquirers in the field; and his topographical and historical knowledge of a locality often added greatly to the pleasure of a visit to it—e.g., Cadzow and Loudoun; at both of which places he acted as leader to the Society.

The following is a list of Mr. Turner's published articles, excluding fugitive contributions which he is understood to have made to the columns of *Science Gossip* and the *Glasgow Herald*. In the *Proceedings*, and *Proceedings and Transactions of the Natural History Society of Glasgow* :—

	Vol.	Part.	Pages.	Published.
1.—“Vegetable Parasites and Saprophytes.”	IV.	II.	203-12.	1881.
2.—“Excursion to Kilmalcòlm.”	V.	II.	159.	1883.
3.—“On a Collection of Plants from Fife and the Lothians.”	V.	II.	174-5.	1883.
4.—“On <i>Coprinus comatus</i> .”	V.	II.	181.	1883.
5.—“The Heteræcism of the Uredines.”	V.	III.	293-301.	1884.
6.—“The Mistletoe.”	N.S. I.	I.	101-116.	1885.
7.—“Notes on the Flora of the Lesser Cumbræ.”	, I.	I.	iv.	1885.
8.—“Notes on the species of <i>Gossypium</i> .”	, I.	I.	xiii.	1885.
9.—“Thomas Hopkirk of Dalbeth: a Sketch of his Life and Botanical Work.”	, I.	II.	196-259.	1886.
10.—“Remarks on <i>Nasturtium amphibium</i> ,” Koch.	, II.	I.	vii.	1888.
11.—“The Cadzow Herd of White Cattle.”	, II.	II.	222-244.	1890.
12.—“Notes on the Botany of Avondale.”—Chapter in Mary Gebbie’s <i>Sketch of the Town of Strathavon and Parish of Avondale</i> . Edinburgh and Glasgow. 1880.				
13.—“Vegetable Villains.”—Four Articles in <i>Good Words</i> (1883), on Fungi, Flowering Parasites and Saprophytes. London. 1883.				
14.—“The Potato Disease.”—An Illustrated Article in <i>Good Words</i> , page 693. 1884.				
15.—“Botany of the Clyde.”—In Pollock’s <i>Dictionary of the Clyde</i> . Glasgow. 1888.				
16.—“Lanarkshire Rambles.”—Pages 1-17. } Both in <i>Annals of the Ander-</i>				
17.—“The Moss-like <i>Tillandsia</i> (<i>Tillandsia</i> } <i>sonian Naturalists’ Society</i> .—				
<i>usneoides</i> , L.)”—Pages 128-31. } Glasgow. 1893.				

Of the last named book, Mr. Turner acted as editor, doing most of this somewhat arduous work in his sick-room, and it was a source of gratification to him to know that the book was a success and had been well received, not only in the small circle of the Society’s members, but in the larger circle of those generally interested in this class of literature, amongst whom the good editing was a subject of remark.

One of Mr. Turner’s earliest triumphs in Glasgow was in connection with the institution under whose roof we meet, he having been one of the few students who, in the days of the old Andersonian University, took first-class honours; and his last work, also crowned with success and honour, was that to which reference has just been made in connection with our Society meeting under this same roof. Thus the new and the old meet, honouring him whose loss we mourn all the more while recalling his active and generous life.

For information regarding Mr. Turner’s early life, we beg to acknowledge our indebtedness to the *In Memoriam* notice in the *Proceedings of the Natural History Society of Glasgow*.

II.

THE POLLOK WYCH ELMS.

(*Ulmus montana.*)

BY JOHN BOYD.

(*Paper read 4th April, 1894.*)

THE "Wych Elms of Polloc, Renfrewshire," as they are called in Strutt's *Sylva Britannica*, have without doubt been looked upon as remarkable trees of their kind for the last century at least. This is all the more evident from the fact that they are figured in the Scottish part of the above work—*Sylva Scotica*, published in 1822. They are also mentioned in Loudon's great work, *Arboretum et Fruticetum Britannicum*, published sixteen years later. In Hugh Macdonald's *Rambles Round Glasgow* the writer says that—"Old Evelyn would have travelled a long summer day, and reckoned himself amply repaid for his labour by the sight of a single group of wych elms which grace the bank of the river (White Cart) a little to the east of the mansion-house."

The four great trees which stood so many storms have now been reduced to two, the largest pair having been blown down during the storm which visited us with so many disastrous results on the morning of the 12th February last (1894).

The following facts about these fallen veterans will no doubt be interesting to all, and give those who have not visited Pollok some conception of their dimensions. Before going into figures it may be worth mentioning that when the trees were blown down they were considerably past their best, decay having set in, both in roots and stems, and the main roots were completely decayed away to within from three to five feet from the stem. In fact, when one saw them uprooted, the marvel was that they had stood so long, for they must, for a few years back at least, have been

standing almost by balance, and drawing any little sap they were taking from the soil by several young roots, the strongest not more than $2\frac{1}{2}$ inches thick.

When several members of this Society visited Pollok, on 19th March, 1892, the four trees were carefully measured, with the following results :—

Tree nearest mansion-house,	at 5 ft. $5\frac{1}{2}$ in.	(river side),	girth,	13 ft. $9\frac{1}{4}$ in.
„ next to the above,	at 4 ft. $2\frac{1}{2}$ in.,	-	„ „	11 „ $10\frac{1}{2}$ „
„ „ „	at 3 ft. $11\frac{1}{2}$ in.,	-	„ „	12 „ $0\frac{1}{2}$ „
„ „ „	at 4 ft. 9 in.,	-	„ „	13 „ $1\frac{1}{2}$ „

A view is here given (see frontispiece) of the group from a photograph by Mr. James Mitchell taken on this occasion.

The first-named tree, which stood next the house, and is described by Strutt as a tree of extraordinary health and vigour, having large and luxuriant foliage, is the only one of which measurements are given by him. In 1812 it measured, at 5 feet from the ground, 10 feet 10 inches in circumference, and in 1824 it measured, at 5 feet from the ground, 11 feet 10 inches in circumference. It was 85 feet high, and was said to contain 669 feet of solid wood—a rather erroneous estimate. It could not contain at most more than three-fourths of that amount measurable wood, *i.e.*, including all branches to about four inches diameter at small ends, even allowing it to have lost some of its large branches since then. To prove how far this calculation is wrong, I may say that a round log, measuring 11 feet 10 inches circumference all its length, containing 669 feet, would require to be 90 feet long, which is 5 feet more than the height of this tree as given above. When the tree fell it measured 92 feet long, and 13 feet 10 inches circumference at 5 feet up, and 12 feet 2 inches circumference at $12\frac{1}{2}$ feet up. It was so much decayed in the heart that no attempt could be made to ascertain its age by counting the rings or annual layers of wood. It divided into two leading stems at 25 feet from the root, and the stem up to this point contained almost 200 cubic feet of wood and weighed $7\frac{1}{2}$ tons, and had it been solid would have been over 8 tons. The whole tree contained 490 cubic feet measurable wood, and estimating measurement for weight of all branches to about $2\frac{1}{2}$ inches diameter, it would contain about 700 cubic feet.

The other tree blown down (which stood at the opposite end of the group) was the most vigorous of the lot, and measured 90 feet long and 13 feet 3 inches circumference at 5 feet up, and 11 feet 10 inches at 11½ feet up. Unlike the former it kept one main stem all its length, and had a clear bole of 23 feet, which contained 160 cubic feet of wood, weighing 7 tons 6 cwts. The whole tree contained 450 cubic feet measurable wood, and, estimating for branches as before, the cubic contents would be almost 600 feet. The united total weight of the trees would amount to something like 60 tons exclusive of small branches and twigs. The last-named tree was not nearly so much decayed as the former, and permitted a very fair estimate of their age being arrived at, by counting its annual rings of growth. By this they would appear to be about 300 years old. At the point where the tree was cross-cut off the root 297 rings were counted, but as this was about two feet from the root proper, there is no doubt that the age of the trees is not less than 300 years. On clearing away the roots it was quite apparent that the ground had been raised about the trees at some time, and as there is no record of when this was done, the old measurements cannot be relied on as comparisons. Very probably these venerable sylvan giants were planted and growing on the same site while the land of the hills and heather was still an independent kingdom, and before the Thistle and Rose had joined in partnership. The two trees still standing look very bare and forlorn without their more majestic right and left hand supporters, which were much larger and by far the finest looking members of the group.

Should the members of this Society wish to have a look at these remaining living links with the past it would be advisable to make arrangements before many winters elapse, or instead of seeing them, they may only hear of them as having gone the way of their more stately companions.

III.

PLANTS OF THE KENMUIR DISTRICT OF THE CLYDE.

BY JOHN R. LEE.

(*Paper read 1st May, 1895.*)

THE Kenmuir district of the Clyde has long been one of the favourite haunts of local botanists, and probably most Glasgow students have here made their first acquaintance with the floral gems which adorn our woodlands and hedgerows. Apart from its botanical interest altogether, the localities around Carmyle have been rendered almost classic, alike to the naturalist and the merely general lover of Nature, by the *Rambles Round Glasgow* of Hugh Macdonald.

It has been customary for some time past for the botanists of our Society to pay at least one visit annually to this part of the Clyde; and in view of this, the following notes on a few of the species occurring in the locality may be of interest. My remarks refer only to those plants to be observed on the banks of the river, extending upwards on the north side from the Bogle Hole to Kenmuir Bank, and on the south side from Cambuslang Bridge to the mouth of the Rotten Calder at Newton.

Both banks of the river are wooded throughout most of the distance, especially the north bank from Kenmuir down to Cambuslang Bridge. There is also a fair stretch of wood on the south bank above the new railway bridge. In early spring these shady nooks of the Clyde are full of such favourites as the violet, lesser celandine, and wood sorrel, followed later on by the bluebell, red campion, and stitchwort. These common plants serve to make the banks beautiful, and to sustain our interest and enthusiasm whilst searching amongst them for their rarer

companions. Not that we consider rare plants more interesting, however. The botanist, who is not merely a plant collector, always regards as most interesting those species which are characteristic of the locality, and these are not necessarily the rare ones. Rare plants are chiefly interesting on account of their rarity alone, whereas the commonest species are usually those most perfectly adapted to their environment, and this adaptation is the point of greatest interest to the student.

On the north bank of the river, between Cambuslang Bridge and the Bogle Hole, there is a wide haugh where, at the water's edge, is a dense growth of willows, and beside them the sandy soil is covered with butter-bur. A number of interesting plants have found a lodgment here; and, indeed, at this point nearly every bit of bush and shrubbery shelters quite a host of attractive species.

I shall not attempt, however, to describe specifically the various localities included within the boundaries I have named, but merely take the different species, arranging them according to their natural orders, and indicating their occurrence in the district. The list makes no claim to completeness, as I only mention those species which have some particular interest.

RANUNCULACEÆ.

Of the common species of ranunculus, I have already alluded to the great abundance of the lesser celandine (*Ranunculus Ficaria*). The flowers of this plant have a tendency to become white—a phenomenon which can be easily observed in the woods in the district.

R. Bulbosus, rather an uncommon species in our district, grows abundantly on the south bank at Cambuslang.

R. auricomus, the goldilocks. According to Hennedy, this plant was formerly a denizen of the Carmyle Woods; but it appears to have become extinct. At all events, I have never been able to find it in the locality named.

R. fluitans.—This curious plant is common in the Clyde opposite Daldowie and below Carmyle. Unlike the other aquatic ranunculi, this plant prefers rapidly flowing water, and in the rocky bed of the Clyde hereabouts it attains considerable luxuriance.

Anemone nemorosa is abundant in the open parts of the wood on the south bank, but is much less common on the other side of the river.

Trollius europæus, the globe flower, is still a feature of the river's edge at Kenmuir, particularly near the Marriage Well, and it also grows at one or two spots further down the stream.

CRUCIFERÆ.

The most interesting plant of this order is the garlic-mustard (*Alliaria officinalis*), which, though not abundant, is to be found here and there among the leaves of the butter-bur, etc.

RESEDACEÆ.

One of the rarest plants of the district is the dyer's weed (*Reseda Luteola*), which occurs occasionally around the Bogle Hole.

CARYOPHYLLACEÆ.

Silene inflata (bladder campion).—This species occurs at Kenmuir, near the water's edge, above the Marriage Well. The strong tendency to zygomorphism in the flower is a curious anomaly in a plant of this order.

Lychnis diurna.—The "diceiousness of the red campion" is one of the things which, according to the late Mr. R. Turner, the novice goes to Kenmuir to study and to wonder over. This beautiful plant, however, so conspicuous a feature of the old wood, has suffered greatly by the destruction of the trees, for only stunted specimens of it now appear. It is still very abundant in the woods on the south bank.

Stellaria Holostea, the greater stitchwort, is another common woodland gem, to which the same remarks apply.

S. nemorum, a much less common plant, is particularly abundant in the woods below Carmyle, and on the south bank opposite Kenmuir.

Arenaria trinervis is common in the woods.

HYPERICACEÆ.

Three species of St. John's wort are to be found on the banks of the Clyde hereabouts. Of these the commonest is *Hypericum quadrangulum*, which occurs on the opener parts of the banks on both sides of the river.

H. perforatum is also common, especially in shady places, at Kenmuir, etc. These two have large and conspicuous flowers, and make a striking feature of the banks towards the end of summer.

The third species, *H. hirsutum*, is less common. It has smaller and less conspicuous flowers, but is generally a much more elegant plant than either of the others.

GERANIACEÆ.

Besides the common herb-robert, two species of geranium grow in the woods above Carmyle. One of these, *Geranium pratense*, occurs in one or two stations in the shadiest parts of the wood. The other species is *G. sylvaticum*, always interesting to botanists as being the plant which first attracted attention, a century ago, to the adaptation of floral structures to insect fertilisation, a subject which has since been a fruitful source of contention amongst theorists of every school. This plant is, curiously enough, rather uncommon in the vicinity of Glasgow, although a few miles eastward it is one of the commoner woodland species.

ROSACEÆ.

Prunus spinosa, the sloe, is not common, but a few bushes grow on the south bank a little above Carmyle.

Prunus Avium, the gean-tree, is a conspicuous feature of the Clyde in May. It is abundant around Carmyle and on the south bank opposite. A few small bushes still grow at Kenmuir, but formerly this was one of the great ornaments of the place in spring.

Prunus Padus, the hagberry, is frequent in the woods on both sides of the river.

Rubus Idæus, the raspberry, a by no means common shrub in the immediate vicinity of the city, is to be found on the south bank near Newton.

SAXIFRAGACEÆ.

Saxifraga granulata is always interesting as being the only common lowland member of a distinctly alpine genus. It occurs, but sparingly, on many parts of the river-banks; but there is a particularly fine bed of it on the south side opposite Carmyle.

Chrysosplenium alternifolium may be met with on the south bank by anyone who cares to look for it; and, of course, no botanist ever passes a clump of golden saxifrage without looking to see if this species is to be found along with the common opposite-leaved one, *C. oppositifolium*. Although the two species are so similar in habit, they are nevertheless very distinct and easily recognisable, the rarer one being a much finer plant, though not so showy as the other.

UMBELLIFERÆ.

Myrrhis odorata, the sweet Cicely, occurs here and there on both sides of the river, but not abundantly.

One of the plants which seems to have suffered most by the cutting down of Kenmuir Wood is the rough chervil (*Chærophylum temulentum*). This was one of the most abundant inhabitants of Kenmuir: now there is scarcely a plant of it left.

CAPRIFOLIACÆ.

Viburnum Opulus, the guelder rose. This handsome shrub is common in the woods above Carmyle. Perhaps the numerous visitors from the city are responsible for the absence of its flowers; at any rate they are not very often to be seen.

Adoxa Moschatellina.—This anomalous little plant is common in the shady parts of the woods. The most curious thing about it is the flower-head, which consists of five flowers arranged in a cube, of which the terminal one has its parts arranged in fours, the others in fives. The moschatell is rather local in its distribution, being usually abundant enough in the places where it grows.

RUBIACÆ.

Of the bedstraws, *Galium Mollugo* is mentioned by Hopkirk as growing at Carmyle in his time, but it is probably extinct now.

G. boreale is to be found in the woods above Carmyle and on the south bank opposite Daldowie, in both of which stations it appears to be spreading profusely. This is probably a stranger from the upper part of the Clyde, washed down by the stream.

Asperula odorata, the woodruff, is one of the plants which has suffered by the destruction of Kenmuir Wood, being now uncommon. It occurs sparingly in the woods on the south bank.

COMPOSITÆ.

Doronicum Pardalianches (leopard's bane).—This may now be regarded as a common plant in this locality. It has found a lodgment in various places, more especially on the north bank, and has spread considerably during the last few years. The largest bed of it is in Carmyle Wood below the village, where its handsome yellow flower-heads make a fine display in May and June.

Senecio viscosus.—This species of groundsel, which is somewhat local around Glasgow, occurs on the roadsides about Bogle Hole.

S. saracenicus.—This handsome plant has obtained a footing within the last year or two at various points on the north bank below Kenmuir. The only large bed of it, however, is amongst the butter-burs below Cambuslang Bridge.

Tragopogon pratensis (goat's beard), a rather rare species in our district, is frequent on the north bank about Carmyle.

CAMPANULACEÆ.

Campanula latifolia, the giant bell-flower, is one of the most striking plants of the Clyde. It is very common in the woods on both sides of the river.

PRIMULACEÆ.

Primula vulgaris.—The primrose is a favourite which, at this part of the Clyde, is rare. It occurs on the south bank above Carmyle.

Of the loosestrifes *Lysimachia nemorum* used to be frequent at Kenmuir; but since the destruction of the wood I have never seen it, nor have I met with it elsewhere in the vicinity.

L. vulgaris.—This is a rare species in the Glasgow district. It is recorded in Henneidy's *Flora* for Kenmuir Bank, and still exists there at the edge of the stream near the Marriage Well. I have also found it in one or two stations in the woods below Kenmuir, so that we may hope that this beautiful species is spreading. Should it become at all abundant it would certainly be an acquisition to the locality.

BORAGINACEÆ.

Both species of comfrey are to be found in the district. The purple one (*Symphytum officinale*) is rare, however. There used

to be a bed of it at Kenmuir, but this has disappeared. It is occasionally met with here and there, probably as an escape from cultivation. The tuberous comfrey (*S. tuberosum*), on the other hand, is abundant everywhere on both sides of the river.

OROBANCHACEÆ.

At one spot on the south bank of the river a small bed of the rare *Lathrœa squamaria* (toothwort) has occurred up to this year.

CONVOLVULACEÆ.

The great white convolvulus (*Calystegia sepium*) grows among the willows at Bogle Hole.

LABIATÆ.

Nepeta Glechoma, the ground ivy, is remarkably abundant in Carmyle Woods. Two forms of this plant occur, and they are both common. One is of considerable size, with large and perfect flowers of a brilliant azure blue; the other a dwarf, with female flowers only, of a much smaller size and less brightly coloured.

Of the woundworts, *Stachys sylvatica* is abundant on both sides of the river, whilst a much less common species, *S. palustris*, is also frequent around Carmyle.

Lamium album (white dead-nettle).—There is a large bed of this plant at Kenmuir, and since the destruction of the wood it appears to have spread considerably. This species is rare in Clydesdale, though common in the East of Scotland.

POLYGONACEÆ.

Polygonum Bistorta, the bistort, is very abundant on the south bank at Cambuslang. It also occurs in the woods further up the river on the south side, and sparingly on the north bank below Carmyle.

SALICACEÆ.

Of the willows, which form such a conspicuous feature of this part of the Clyde, the most abundant and interesting is *Salix purpurea*. Dense beds of this species fringe the water's edge on both sides, extending upwards from Cambuslang Bridge. A variety of this plant, the *Salix Helix* of Linnæus, with yellow twigs and opposite leaves, is common in these beds.

The crack-willow (*S. fragilis*) may also be mentioned here as being one of the characteristic trees of this locality. One or two fine specimens of this graceful tree may be seen on the north bank below Kenmuir.

LILIACEÆ.

The garlic (*Allium ursinum*) is very abundant on the south bank in the woods above Carmyle, and is frequent along the banks on both sides. *A. vineale* is mentioned in Henedy as growing around Carmyle, but I have never found it in the locality.

Scilla nutans, the wild hyacinth, is, as I have already remarked, abundant in the woods. The white-flowered variety has been noted at Kenmuir.

CYPERACEÆ.

Carex pendula, the largest of the British sedges, and one of the rarer ones in Clydesdale, grows at the Marriage Well, and also on the south bank opposite Kenmuir.

C. acuta.—A fine bed of this extremely graceful and rather uncommon species grows in the stream near the edge, on the north side, about half-way between Kenmuir Bank and Carmyle.

C. hirta.—There is a large bed of this species on the marshy ground beside the Marriage Well.

GRAMINEÆ.

Of the many beautiful sylvan grasses which adorn the woods around Carmyle, perhaps the most attractive is the false brome (*Brachypodium sylvaticum*) which grows in profusion on the shady banks below Kenmuir. The false oat (*Arrhenatherum avenaceum*) is exceedingly abundant on both sides of the river, and was formerly one of the characteristic plants of Kenmuir Wood. Of the larger grasses, perhaps the three most striking are the common reed-grass (*Digraphis arundinacea*) and the two large fescues (*Festuca elatior* and *F. gigantea*).

I cannot at present enter in detail into the cryptogamic flora of this district. There is a fair variety of the commoner mosses, and one or two interesting species of the larger fungi have been noted at excursions of the Society. I may mention that the district is remarkably lacking in ferns. Beyond one or two miserable stunted specimens of the common male fern, I have never found any growing on these banks.

IV.

CLYDESDALE MOSSES.

BY JAMES MURRAY.

THE list appended is a *résumé* of the mosses which have been brought under the notice of the Society at meetings and excursions during the last four years.

It is necessarily far from complete, owing to the short period over which observations have extended, to the small number of workers in the field, and to the limited district to which the Society is confined in its excursions. Nevertheless, several interesting records have been made, a number of mosses having been found that seem to have been hitherto overlooked in our neighbourhood.

A considerable number of the commonest species are omitted, as little interest attaches to reports of mosses which are well-nigh universal in their distribution. In this connection mention may be made of the list compiled by Dr. Stirton for the *Fauna and Flora of Clydesdale and the West of Scotland* (Glasgow, 1876).

The district covered approximately coincides with that defined by Henedy in the *Clydesdale Flora*. It extends up the valley of the Clyde as far as Tinto, and down the firth to Arran and the opposite coasts, taking in the Campsie and Kilpatrick Hills on the north.

The portion of this district lying nearest Glasgow has naturally been more thoroughly worked than the outlying parts. On this account, and in order to give the list a special local interest, prominence has been given to reports of species occurring within a radius of 20 miles of the city. The more distant parts have only been drawn upon in the case of species which have not been found within the narrower limits.

The rarer mosses have the names of the finders appended. This is also done when only one notice of the occurrence of a

species has been received, as well as in cases where it has not been possible to examine the specimens before including them in this list. However, in order to reduce the likelihood of error as far as possible, the great majority of the specimens have been carefully gone over and corrected. It is therefore hoped that the list, though incomplete, may be found trustworthy as far as it goes. For the specific names and authorities, Hobkirk's *Synopsis of British Mosses* has been followed.

Andreæceæ.

ANDREÆA PETROPHILA, Ehr.—Milngavie, Campsie.

Sphagnaceæ.

SPHAGNUM RIGIDUM, Schimp.—Blantyre Moor.

Weissiaceæ.

HYMENOSTOMUM MICROSTOMUM, Hedw. — Lennoxton (R. D. and T. B. Wilkie).

GYMNOSTOMUM RUPESTRE, Schw.—Campsie Hills.

G. CURVIROSTRUM, Hedw.—Calderwood Glen, Craignethan.

ANÆCTANGIUM COMPACTUM, Schleich.—Kilmun (R. D. and T. B. Wilkie).

EUCLADIUM VERTICILLATUM, L. (?)—Cadzow Burn.

GYROWEISSIA TENUIS, Schrad.—Cadzow.

WEISSIA VIRIDULA.—Campsie Hills.

DICRANOWEISSIA CIRRHATA, Hedw.—Lesmahagow.

RHABDOWEISSIA DENTICULATA, Brid.—Campsie (R. D. and T. B. Wilkie).

Dicranaceæ.

DICRANELLA CRISPA, Hedw.—Polmadie (R. D. and T. B. Wilkie).

D. SQUARROSA, Schrad.—Campsie Hills, Fiddler Gill.

D. CERVICULATA, Hed.—Calderwood Glen.

D. RUFESCENS, Turn.—Millheugh, Giffnock.

DICRANUM BONJEANII, De Not.—Milngavie, Fiddler Gill.

D. FUSCESCENS, Turn.—Kilmun (R. D. and T. B. Wilkie).

D. SCOTTIANUM, Turn.—Inch Calliach (T. King).

CAMPYLOPUS PYRIFORMIS, Brid.—Calderwood Glen.

C. SUBULATUS, Schpr.—Dungavel Hill.

C. FLEXUOSUS, Brid.—Frankfield Loch, Blantyre Moor.

Leucobryaceæ.

LEUCOBRYUM GLAUCUM, Hampe.—Giffnock, Blantyre Moor.

Fissidentaceæ.

FISSIDENS EXILIS, Hedw.—Steps Road.

F. PUSILLUS, Wils.—Banks of the Clyde and Calder.

F. VIRIDULUS, L.—On stones in the Avon.

F. OSMUNDIOIDES, Hedw.—Holland Bush Glen.

F. ADIANTOIDES, Hedw.—Bearsden, Campsie Hills.

Seligeriaceæ.

SELIGERIA RECURVATA, B. and S.—Calderwood Glen—very plentiful on the banks of the Avon.

BRACHYDONTIUM TRICHODES, N. and H.—Cadzow.

BLINDIA ACUTA, Huds.—Fiddler Gill, Kilmun.

Leptotrichaceæ.

DITRICHUM HOMOMALLUM, B. and S.—Kilmun (R. D. and T. B. Wilkie).

DISTICHUM CAPILLACEUM, B. and S.—Stonebyres Fall.

Pottiaceæ.

POTTIA HEIMII, B. and S.—Seamill (W. Campbell).

DIDYMODON RUBELLUS, B. and S.—Campsie (R. D. and T. B. Wilkie).

TRICHOSTOMUM TOPHACEUM, Brid.—Giffnock (R. D. and T. B. Wilkie).

BARBULA AMBIGUA, B. and S.—Calderwood Glen, Cathkin.

B. TORTUOSA, W. and M.—Campsie Hills, Fiddler Gill.

B. SUBULATA, Brid.—Kittochside, Lesmahagow.

B. LÆVIPILA, Brid.—Falls of Clyde, Calderwood Glen.

B. RURALIS, Hedw.—Seamill (J. R. Lee), Wemyss Bay (W. Campbell).

B. PRINCEPS, De Not.—Road from Hamilton to Lanark (D. L. Murray).

Galymperaceæ.

ENCALYPTA CILIATA, Hedw.—Ballagan Glen.

Grimmiaceæ.

- GRIMMIA MARITIMA, Turner.—Seamill (J. R. Lee).
 RACOMITRIUM PROTENSUM, A. Braun.—Milngavie, Kilpatrick Hills, Campsie.
 R. SUDETICUM, Funk.—Tinto.
 PTYCHOMITRIUM POLYPHYLLUM, B. and S.—Ballagan Glen, Cathkin.
 AMPHORIDIUM LAPPONICUM, B. and S.—Kittochside (R. D. and T. B. Wilkie).
 ZYGODON VIRIDISSIMUS, Dicks.—Cadzow.
 ULOTA INTERMEDIA, Sch.—Kilmun (R. D. and T. B. Wilkie).
 U. PHYLLANTHA, Brid.—Kilmun, Arran.
 ORTHOTRICHUM RUPESTRE, Schl.—Calderwood, Ballagan Glen.
 O. AFFINE, Schrad.—Cadzow, Craignethan.
 O. DIAPHANUM, Schrad.—Hamilton.
 O. LEOCARPUM, B. and S.—Lanark (R. D. and T. B. Wilkie).

Splachnaceæ.

- TETRAPLODON MNIOIDES, L. fil.—Tinto.
 SPLACHNUM SPHÆRICUM, Linn. fil.—Tinto.

Bartramiaceæ.

- BARTRAMIA ITHYPHYLLA, Brid.—Kittochside, Dungavel Hill.
 B. POMIFORMIS, Linn.—Blanefield (W. Campbell).
 B. OEDERI, Gunn.—Campsie Glen (J. R. Lee).
 BREUTELIA ARCUATA, Dicks.—Campsie Glen, Fiddler Gill.

Bryaceæ.

- LEPTOBRYUM PYRIFORME, Linn.—Hamilton.
 WEBERA ALBICANS, Wahl.—Fertile in Calderwood Glen.
 ZIERIA JULACEA, Sch.—Ballagan Glen.
 BRYUM INCLINATUM, Swartz.—Kilmun (R. D. and T. B. Wilkie).
 B. ALPINUM, L.—Campsie and Kilpatrick Hills.

Georgiaceæ.

- TETRODONTIUM BROWNII, Dicks.—W. Kilbride (W. Campbell).

Mniaceæ.

- MNIUM ROSTRATUM, Schrad.—Hamilton.
 M. STELLARE, Hedw.—Calderwood Glen, Kittochside.

AULACOMNION ANDROGYNUM, Linn.—Cadder Wilderness (R. D. and T. B. Wilkie).

A. PALUSTRE, Linn.—Fertile in Glenlean (E. R. Burden) and at Milngavie.

Polytrichaceæ.

POGONATUM ALOIDES, Hedw.—Campsie, Blantyre Moor.

P. URNIGERUM, Linn.—Giffnock (R. D. and T. B. Wilkie).

POLYTRICHUM GRACILE, Dicks.—Frankfield Loch.

P. FORMOSUM, Hedw.—Giffnock (R. D. and T. B. Wilkie).

P. STRICTUM, Banks.—Dungavel Hill.

Fontinalaceæ.

FONTINALIS ANTIPYRETICA, L.—Fertile at Campsie and Lesmahagow.

F. SQUAMOSA, L.—Milngavie, Calder Water at Lochwinnoch (R. D. and T. B. Wilkie).

Cryphæaceæ.

HEDWIGIA CILIATA, Dicks.—Campsie, Brodick.

Neckeraceæ.

NECKERA CRISPA, Linn.—Campsie Hills, fertile in Shielhill Glen (E. R. Burden).

HOMALIA TRICHOMANOIDES, Schreb.—Cadzow.

THAMNIUM ALOPECURUM, Linn.—Kittochside, Blantyre Priory.

Hookeriaceæ.

PTERYGOPHYLLUM LUCENS, Linn.—Calderwood Glen, Craignethan.

Leskeaceæ.

LESKEA POLYCARPA, Ehr.—Banks of the Avon.

ANOMODON VITICULOSUS, Linn.—Campsie Hills, Craignethan, Cadzow.

THUIDIUM TAMARISCINUM, Hedw.—Fertile at Stonebyres Fall.

Hypnaceæ.

CLIMACIUM DENDROIDES, W. and M.—Campsie, Frankfield Loch, Cadzow.

ISOTHECIUM MYURUM, Pollich.—Cadzow, Calderwood Glen.

BRACHYTHECIUM SALEBROSUM, Hoffm.—Hamilton.

- B. ALBICANS, Neck.—Hamilton, West Kilbride.
- B. RIVULARE, Bruch.—Cadzow, Campsie.
- HYCOMIUM FLAGELLARE, Dicks.—Kilmun (R. D. and T. B. Wilkie).
- RHYNOSTEGIUM TENELLUM, Dicks.—Cadzow, West Kilbride (R. D. and T. B. Wilkie).
- PLAGIOTHECIUM BORRERIANUM, Spruce.—Plentiful in glens about Hamilton.
- AMBLYSTEGIUM FLUVIATILE, Swartz.—In the Avon at Fairholm.
- A. RIPARIUM, Linn.—Near Hamilton.
- HYPNUM CHRYSOPHYLLUM, Brid.—Frequent in waste places about Hamilton.
- H. STELLATUM, Schreb.—Calderwood, fertile at Milngavie.
- H. ADUNCUM, Hedw.—Giffnock, Possil Marsh.
- H. EXANULATUM, Güm.b.—Blantyre Moor, fertile near Lesmahagow.
- H. FLUITANS, Linn.—Frankfield Loch, Dungavel Hill.
- H. REVOLVENS, Swartz.—Tinto.
- H. FILICINUM, Linn.—Fertile in Cadzow.
- H. PATIENTIÆ, Lindb.—Campsie, Hamilton.
- H. GIGANTEUM, Schp.—Frankfield, Possil Marsh.
- H. PURUM, Linn.—Fertile at Troon.
- H. STRAMINEUM, Dicks.—Blantyre Moor.
- H. SCORPIOIDES, Linn.—Milngavie, fertile at Loch Eck (E. R. Burden).
- HYLOCOMIUM BREVIROSTRUM, Ehrh.—Cadzow, fertile at Gourrock (J. R. Lee).
- H. TRIQUETRUM, Linn.—Fertile at Falls of Clyde (J. R. Lee).
- H. LOREUM, Linn.—Fertile at Kilmun (R. D. and T. B. Wilkie).

V.

RECORDS OF EXCURSIONS IN AYRSHIRE (WITH NOTES).

BY JOHN SMITH.

ON 10th of July, 1886, the first excursion of the Society to Ayrshire was made, the district chosen being the coast line from Portincross to Fairlie.

In the Society's Records of Excursions nothing is said as to what was seen or found; but a few notes on the geological features and natural history resources of the district may be here given.

A prominent trap dyke, which is quarried near West Kilbride town, can be examined at several parts on the way down to the shore at Portincross.

The geological features of the coast line traversed are of especial interest, and consist for the most part of red sandstones. A short distance to the south of Portincross Castle are some highly altered shales, the geological position of which has been disputed—Mr. Carrick Moore, their first describer, considering them to be of Silurian age, and Mr. D. Bell and several members of the Geological Survey ranking them as highly altered members of the cement-stone group of the calciferous formation. It is a point which, owing to the entire absence of fossils in the metamorphosed part, may never be definitely decided; yet, from the stratigraphy of the district, we incline to favour Mr. Carrick Moore's opinion.

A short distance to the north of the little harbour of Portincross—beyond the prominent trap dyke—there is a thick bank of coarse conglomerate, the pebbles of which are mostly of a pink quartzite, many of them having been fractured—even brecciated *in situ*—and the fragments subsequently soldered together. The peculiar

mode of weathering of some of the sandstones on this coast deserves attention, many patches of the rock being hollowed out into strange honey-combed patterns not easily accounted for—such pieces being in great demand for rockeries.

The last rocks on the shore, as one proceeds towards Fairlie Station, are some prominent bosses, partly covered by the tide, and known as “the Black Rocks.” In these rocks, which are volcanic agglomerates, there are pieces of a black mineral resembling anthracite, but determined by Professor Heddle to be *Augite*, and the largest lumps of that substance which have been found in the West of Scotland. They have not crystallized in position, but have been brought up as “pebbles” from the depths below.

In Ardneil Bay, at low water, a glacial bed containing many fossils may be examined, the ponderous shells of *Cyprina Islandica* being conspicuous, and the valves in many cases united.

A few of the botanical treasures of the neighbourhood may be glanced at. In a muddy ditch by the roadside, near the Ardneil Bay villas, there is a healthy patch of Savi's mud rush (*Isolepis Savii*). Ardneil Bank furnishes some good botanical things—the hart's tongue (*Scolopendrium vulgare*), for instance, being still abundant there, some of the fronds having four points. Along the coast line may be got the crow garlic (*Allium vineale*), the bloody crane's bill (*Geranium sanguineum*), the broad and the narrow-leaved blysmus (*Blysmus compressus* and *B. rufus*), the celery-leaved crowfoot (*Ranunculus sceleratus*), (which before the days of poorshouses was much used by beggars to produce ugly ulcers), the shore whorl-grass (*Catabrosa aquatica* var. *littoralis*), and the sea hard-grass (*Lepturus filiformis*).

The retiring tide lays bare a large area to the south-west of Fairlie, and part of this patch is prolific in the production of the common cockle (*Cardium edule*), which is much gathered here as bait. A large part of this area is also much covered by the sea-flowering plant or grass-wrack, both species being represented, viz., *Zostera marina* and *Z. nana*.

An excursion to Fairlie Glen (which had also been visited previously on 11th June, 1887) and neighbourhood was made on the afternoon of Saturday, 7th June, 1890.

The first place visited was the old Castle of Fairlie, which is now a breeding place of the jackdaw and swift, the latter being locally known by the name of the "cran." On the walls the black spleenwort (*Asplenium Adiantum-nigrum*) was growing.

In Fairlie Glen the little stream has laid bare a large section of the calciferous rocks, with beds of trap, some of the latter being of a fine pink colour. Towards the foot of the glen the strata dip at a high angle towards the hills. As the bed of the stream is ascended the dip very gradually becomes flatter, and the sandstone rocks, after changing from red to yellow, go under the thick series of traps which form the great bulk of the hills. Here and there amongst the sandstones are beds of conglomerate. In the glen a variety of the prickly shield-fern (*Polystichum aculeatum* var. *lobatum*) and the wood cranesbill (*Geranium sylvaticum*) were noted; but the angular-leaved shield-fern (*P. angulare*), formerly abundant here, was not observed—another victim to the mere prowling fern gatherer.

In the Kelburne Policies some large silver firs were visited, and near the little bridge over the Kel Burn were noted the angular-leaved shield-fern (*Polystichum angulare*) and the great pendulous carex (*Carex pendula*), a species which sometimes attains the height of 7 or 8 feet. Near the castle are some fine yews, and the remarkable pine, *Pinus insignis*, together with *Cryptomeria japonica*. The following measurements were made:—Yew, near house, 9 feet 8 inches at 1 foot 6 inches from ground; yew (female), inside garden, southern one of a pair, 10 feet 9 inches; yew (male), northern one of this pair, 10 feet 6 inches (female cones were also found on this male tree); silver fir, south-west of pond, 10 feet 9 inches; silver fir, further up glen, 13 feet 5½ inches; silver fir, the one on right hand while facing the monument, 12 feet 5 inches; *Pinus insignis*, near the yews, 7 feet 10 inches; *Cupressus filifera*, near above, 6 feet 8½ inches—all, except the first, taken at the narrowest part of the boles accessible. On the way to the Killingcraig gate the hairy St. John's wort (*Hypericum hirsutum*) and *Luzula pilosa* were observed at the edge of the wood.

The cromlech, locally, but of course erroneously, known as Haco's Tomb, was passed on the right. It is worth a visit, being in a perfect state of preservation, having been protected for ages

under a heap of 1500 cart loads of stones. When it was at first laid bare several skeletons, placed in a sitting position, were got inside of it.

Before leaving Largs the Skelmorlie Aisle, erected in 1636, one of the most magnificent sepulchral monuments in Scotland, was visited. Near to it stands the old "Court Hill" of Largs, a monument of a more primitive type.

A second excursion to the Portincross and Fairlie districts was made on 4th April, 1892, the route taken being the same as the previous one, but in the reverse order.

A number of spring flowers were noted, but none of special rarity. The Old Rock Shelter, near to the Wishing Well, was inspected. When it was explored several years ago a number of archæological relics were discovered, an account of which will be found in the *Archæological and Historical Collections relating to the Counties of Ayr and Wigton*; vol. ii., page 89. Near to this place—at Hawking Craig—was found the very interesting relic known as the Hunterston Brooch, thought to be about 1000 years old. It is now in the National Museum at Edinburgh. At Portincross Castle Mr. John Stewart read a few interesting notes on the castle and its surroundings. Near it there is a Spanish Armada cannon.

Fourteen species of mosses were gathered, among which was *Rhynostegium tenellum*—a moss not noted in the list of the *Fauna and Flora of Clydesdale* (1876).

8797 Nine specimens of lichens were seen, but none of these were of uncommon occurrence.

Among birds the wheatear (*Saxicola ænanthe*) was the only summer visitant noted.

The excursion from West Kilbride to Ardrossan took place on 28th April, 1894, thirty members turning out to it. Law Castle was first visited, and then the lower reaches of the West Kilbride Burn were followed, and near the mouth of it, on the left bank, was seen the remnant of an old fort which was explored some years ago—an account of which will be found in the *Archæological and Historical Collections* above referred to, where some of the antiquities found have been figured. The locality is further interesting from the fact that a number of urns containing

burnt human bones have at various times been unearthed, the spot having probably been the burial place of the fort people.

Proceeding towards Ardrossan, the water parsnip (*Sium latifolium*) was got in leaf in a ditch, and passing along through a plantation growing on the steep bank above the old shore line, the double fort at Glenhead, near the mouth of the Gourrock Burn, was ascended, and found to occupy a very strong position, and to be in a capital state of preservation. Boydston Fort was next visited, and in it the tansy (*Tanacetum vulgare*) was found growing in profusion, although the plants were dwarfed in size. Opposite Boydston, on the shore, the large stone known as the "Boydston Boulder" was observed, partly covered by the tide. From this point of view Arran is seen to advantage in clear weather, but a haze hanging on the firth, the mountain-tops were only dimly visible. Following the line of railway, which here is constructed along the high ground above the old beach, the remnant of Montfode Castle was inspected, and afterwards the Old Fort or Moat Hill, placed a little above the shore line on the right bank of the Montfode Burn.

With the exception of *Sium* (already mentioned), *Saxifraga granulata*, and *Botrychium Lunaria*, the rest of the plants found do not call for special note.

Amongst the birds observed were two summer visitants—the willow wren (*Phylloscopus trochilus*) in numbers, and a pair or two of swallows (*Hirundo rustica*). The remains of several razorbills (*Alca torda*) were seen on the beach—relics of the severe winter.

An excursion to Dalmellington, Ness Glen, and Loch Doon was made on the 21st of May, 1891. It was remarked that none of the deciduous trees except the larch was in leaf. Amongst the flowering plants the most interesting found were *Trollius europæus*; *Rubus saxatilis*, a species characteristic of the upland glens of Ayrshire; *Saxifraga umbrosa*, probably planted in Glen Ness; *S. hypnoides*, an upland glen species; and *Luzula pilosa*. Amongst the ferns were *Aspidium aculeatum* var. *lobatum*, *Hymenophyllum Wilsoni*, and *Asplenium viride*, the last-named only before recorded for Ayrshire from the Largs and Dalmellington districts.

Reticularia umbrina was the most interesting fungus collected.

The chief feature of ornithological interest was the breeding colony of black-headed gulls (*Larus ridibundus*) in Bogton Loch. During the excursion a number of birds was noted, including the yellow wagtail (*Motacilla raii*).

In the entomological department some good things were got, including the caterpillar of the drinker moth (*Odonestis potatoria*), a fine male of *Selenia bilunaria*, and four species of stone flies—*Chloroperla granulatica*, *Nemoura Meyeri*, *N. hymenalis*, and *Fenestra fusiventris*.

The geological features of Loch Doon and Glen Ness are exceedingly interesting as indicating in no small degree the intensity and duration of the glacial period, and the amount of combined river and sub-aerial erosion that has taken place since that epoch. Some hundred years ago the level of the loch was lowered by having a mine driven through the rocks at the head of Glen Ness, and this enables one to examine the anatomy of the rock-bound basin of the loch in a manner which no other locality we know of presents.

Of the existence of the glacial period here there is abundant evidence. The whole area of the loch is hollowed in the Silurian system of rocks (doubtfully set down by the Geological Survey as of Llandeilo age), and a large part, if not the whole, of the area of this hollow has evidently been the work of ice. The machine has gone, but everywhere the implements with which it did its work are lying about. Moraines, some of them of large extent, are scattered about in the loch, here and there conspicuous amongst the debris being large boulders of granite. If we are to judge from what we can see, the whole basin of the loch appears to be smooth and polished, the bosses of rock which rise here and there above the surface of the water being striated in a beautiful manner, telling us, in the most precise language which John Frost can command, that the glacier, which not only filled the hollow of the loch but over-topped all the immediately surrounding heights, moved along slowly but majestically in the direction of the long axis of the loch. As we recede from the sides of the loch the action of ice is still apparent to the practised eye; the polish and striæ may be gone, the surface of the rocks may even have become hacked from long ages of exposure, but the general glaciated outline, the *roches moutonnées*, glacial debris, and the large boulders

of granite resting on Silurian strata are unmistakable signs of the once widespread and powerful nature of the forces which brought them there. An illustration—Plate I.—is given of a glaciated rock surface, near the north end of the loch. About a mile to the west of the loch, near its northern end, there is a large rocking-stone of granite which can easily be made to move with one hand.

In the loch there are, of course, deposits of subsequent formation to those of the glacial period, one of the most interesting being a bed of diatomaceous earth (very rich in the frustules of diatoms and in sponge spicules), which occurs in the loch under a thin bed of peat, but can easily be got at in dry weather. The species in this bed might be worth working out by some of the members of this Society. Samples of the deposit can easily be obtained on the west side of the loch two or three hundred yards from the sluices.

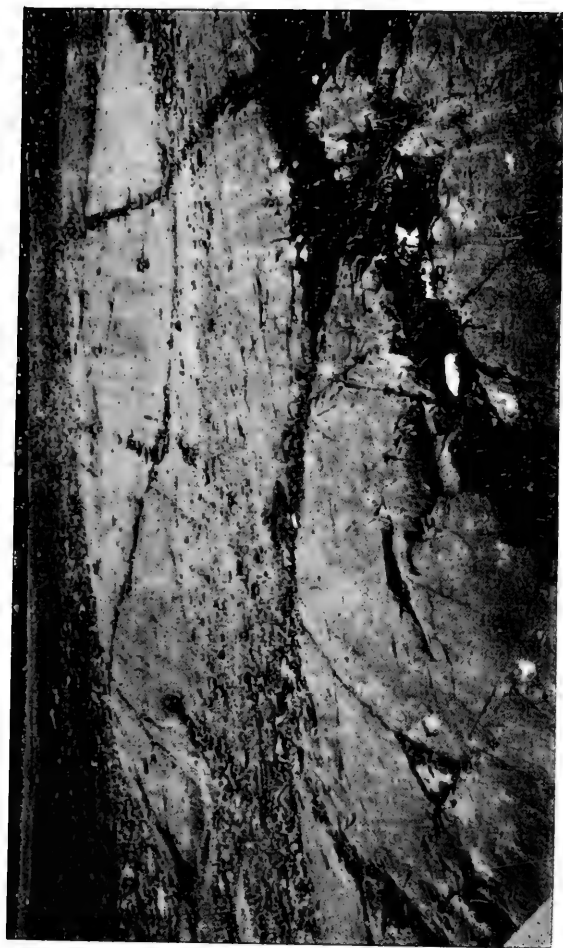
The deep, narrow gorge of Glen Ness, cut out of the same kind of rock as is the loch-basin, is in great measure post-glacial, and presents us with a bit of excavatory work the River Doon has performed since the frozen water was melted from the district.

Amongst the antiquities noted during the excursion were the canoes preserved in a pond at the head of Glen Ness. They were fished out of Loch Doon after the level of the loch was lowered, and in one of them a war club, a battle axe, and some large animal teeth were got. The Picts or Roman Road, which ran from Ayr to Kirkcudbright, passes along the ridge which separates Loch Doon from Loch Muck. Before the party left Dalmellington a look was taken at the ancient Moat Hill, which was repaired a number of years ago and is kept in good order.

A small party paid a visit to the valley of the Girvan, on 19th May, 1887, de-training at Dailly. No detailed report of the excursion is available, but Mr. John Paterson gives the following recollections:—

Approaching Craighead Limestone Quarry the wall rue (*Asplenium Ruta-muraria*) and hart's tongue (*Scolopendrium vulgare*) were found abundantly on a wall by the roadside.

The park at Bargany presented a fine appearance, owing to the tender greens of the trees coming into leaf. A considerable walnut tree was seen but not measured.



From Photo. by]

PLATE I.

GLACIATED ROCK SURFACE, LOCH DOON.

[John Stewart.

BRITISH
MUSEUM
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NATURAL
HISTORY.

Penwhapple Glen was visited chiefly in order to procure some of the worm tracings in the Silurian shales. In this glen and in a glen in the policies at Bargany the oak and beech ferns occurred. Penwhapple is a haunt of the wood wren (*Phylloscopus sibilatrix*), and at Killochan the chiff-chaff (*Phylloscopus rufus*) may be heard. At the latter place, on the roadside, *Geranium phæum* was found.

Culzean Castle and grounds were visited on 19th May, 1892. On passing from Maybole towards the Ayrshire coast a roe deer (*Cervus capreolus*) was observed on the north side of Mochrum Hill. On this hill grows the chickweed winter green (*Trientalis europæa*)—its only Ayrshire station.

Entering the Culzean policies by the Pennyglen Gate, the avenue was followed for some distance, when a detour was made towards the right to examine a small sand and gravel moraine near the farmstead of Balchriston. From here the farm road to the shore was followed, and the sandstone rock and porphyrite cliffs, in the latter of which the famous Coves of Culzean are hollowed, were inspected. On the face of the cliffs, in suitable crannies of the rock, grows the wallflower, which at this early season of the year was loaded with its fine flowers, and presented a spectacle rarely to be seen.

Every one present was delighted with the gardens, and many fine shrubs and flowers were examined, amongst them being *Berberis Darwinii*; *Garrya elliptica*, in catkin; the ivy-leaved toad-flax (*Linaria cymbalaria*); fragrant rosemary (*Rosmarinus officinalis*); and a very fragrant double-flowered whin of large growth attracted a considerable amount of attention.

Several trees were measured:—a silver fir, 14 feet at 3½ feet; a larch, 10 feet 9 inches at 3½ feet; a small-leaved species of maple, 5 feet 11½ inches at 1 foot 8 inches; a rhododendron had a spread of 61 paces in circumference, many of the branches, as is usual with this species, lying on the ground, the plant attaining a height of about 20 feet; an American thorn was 6 feet 10 inches at 3 inches; and a finely-grown Japanese cypress (*Thujaopsis dolabrata* var. *variegata*) had a spread of 33 feet in circumference at the ground. A large wall-trained almost leafless fig tree attracted considerable notice on account of its great lateral spread of 61 feet 9 inches, and from being covered with its

curious flowers. It grows against a 14 feet wall, which it covers to the top, and measures in circumference of trunk, 1 foot 8½ inches at 7 inches. The exposure is south and the spread, 32 feet and 29 feet 9 inches on the respective sides of the trunk.

After visiting the pond, with its black and white swans, its potamogetons, etc., and inspecting some beautiful shrubs of white-flowered broom, which unfortunately require to be protected from the rabbits with wire netting—otherwise there seems no reason why it ought not to grow as freely as the yellow-flowered one—the party left the policies by the Swinton Gate and proceeded to Kirkoswald to have a look at “Tam o’ Shanter’s” grave, passing from thence on to Crossraguel Abbey—a large part of which is still in a fair state of repair. Here the great celandine (*Chelidonium majus*) was found in flower.

The day being exceedingly fine, over sixty plants were noted in flower; the rarest finds being Alexanders (*Smyrniium Olusatrum*), *Vicia sylvatica* in leaf, *Fedia olitoria*, *Cerastium tetrandrum*, and the sea splenwort (*Asplenium marinum*).

The Spring Holiday of 1893 (3rd April) was spent by forty-one members of the Society in the district to the south of Ayr, Cambusdoon being the first place visited. Here a beech, situated about 100 yards from the gate, was found to be 12 feet 10 inches at 4 feet 4 inches, and at the gate a large shrub of the sea buckthorn (*Hippophæ rhamnoides*) was examined. The flowering currant (*Ribes sanguineum*) and the jasmine (*Jasminum nudiflorum*) were in bloom, and a fair sized specimen of the Corstorphine plane was already in foliage in an adjoining park. The leopard’s bane (*Doronicum Pardalianches*) was in flower in several parts of the policies, and a number of fine shrubs and trees were noted.

The way to the Castle of Newark was by Alloway Kirk and the Auld Brig o’ Doon; the avenue leading to the castle being bordered by two rows of fine silver fir trees. The remains of the dule or hanging tree are still preserved as the centre-piece to a rockery. Near the castle a Spanish chestnut (*Castanea vulgaris*) was measured and found to be 17 feet 6½ inches at 4 feet. A Scots fir (*Pinus sylvestris*) near it was 12 feet 1 inch at 4 feet. As Newark is situated some distance above the low ground, a fine view to the north and north-west is obtained from it, and this is considerably enhanced by ascending to the top of Newark Hill.

The next point of interest was Lagg Quarry, situated in the trap of old red sandstone age, which occupies in this district an area of about 9 square miles. Here some fine specimens of agates were obtained, and in this quarry they sometimes reach a length of 3 feet. Indeed this trap area is at parts exceedingly rich in agates, and on patches of ground broken up by the plough they are sometimes found lying in abundance, but, unfortunately, these stones are generally traversed by weather-flaws.

About half of the party went down to the shore below Glenayes, the others going nearly as far as Dunure and returning by the shore. The view of the district about Dunure, with its old castle, quaint little harbour, and sea-beaten cliffs, was much admired. On the way back ample opportunity for studying the shore, rocks and cliffs, was afforded. The porphyrites were found to be very amygdaloidal at parts, and when not containing agates the amygdules were composed for the most part of carbonate of lime.

The most remarkable shore plant of the district is the vernal squill (*Scilla verna*), a plant not found on either the Kyle or Cunninghame shores of Ayrshire. On the cliffs the rose root (*Sedum Rhodiola*) grows luxuriantly and somewhat plentifully, and the milk-white blossoms of the scurvy grass (*Cochlearia officinalis*) are in crowning abundance.

Passing the large hitch (fault) below Lagg, the party was at once confronted by a "change of metals," as the miners say, the traps giving way to fine much-weathered sandstone cliffs penetrated by many caves, some of them having been the habitations of man in bygone ages, and containing deposits in which remnants of his handiwork are lying buried. The sandstones are sharply cut off, as they were brought in, by another hitch (fault) which, when the tide is out, can be traced in the tide-race for some distance, a shelf of sandstone forming a plain of marine denudation, being raised a few feet above the cement-stone group of the calciferous period. Let the thirsty excursionist trace this hitch shoreward, and just at the limit of the beach he will be well repaid by finding a spring of water which "contains abundance of God and costs nothing." The Carrick shore is spread with numerous boulders, many of them being erratics, and amongst the gravel fine solid agates are always to be obtained. The Heads of Ayr are a conspicuous feature, and are composed of a very friable volcanic

ash, the lines of bedding of the ashes forming the slopes of part of an old cone, which is easily traced seawards when the tide is out.

A number of shells were got along the shore here, *Venus fasciata* being frequent and fine, although a few miles further north it is seldom seen as a living species, but in the Shewalton Raised Beach Beds it is quite common as a fossil.

Greenan old Castle was inspected. On the grassy south slope beside it *Trifolium striatum* (the soft knotted trefoil) grows, a plant very rare in Ayrshire. Behind the castle, landwards, are two extensive ditches which may date from pre-castle times.

The "Diel's Dyke" excited some interest, as besides its magnitude and structure, it encloses a patch of the cement-stone series, part of which has assumed a curious globular structure.

The ornithologists noted quite a number of birds during the day, the summer visitants being the chiff-chaff (*Phylloscopus rufus*) at Cambusdoon, and the wheat-ear (*Saxicola ænanthe*).

Thirty-one wild plants were found in flower during the excursion.

The Troon excursion took place on 11th of July, 1891, the north shore being first visited. The principal plants noted there were *Papaver Argemone*; *Anthriscus vulgaris*, which occurs in but few Ayrshire stations, and never far from the sea; *Lycopsis arvensis*, quite a weed in potato ground; *Conium maculatum*, the leaves of which were observed to have been eaten by some kind of larvæ, a large number of which were on the plants; *Rosa spinosissima*, *Pimpinella Saxifraga*, and *Malva sylvestris*.

The sandy beaches which stretch both to the north and south of Troon are fine hunting ground, after storms, for a large variety of shell-fish, crabs, sea-urchins, star-fishes, sea-weeds, and many other forms; and after exceptionally severe storms, fishes and many dead sea-birds may be found. When the foundations were being cut for the gasometers, a lot of clay, rich in boreal and other shells, was put out and left on the beach, but it has now been scattered by the waves.

Proceeding to the Ballast Bank (a large artificial mound built up by the ballast taken from ships), a number of alien plants and others, which have taken possession of it, were got. Amongst them were *Diplotaxis muralis*, *Senebiera Coronopus*, *S. didyma*, *Lepidium*

Draba, *Artemisia vulgaris*, and *Convolvulus arvensis*. This last rare plant was growing in profusion, and presented a magnificent sight with its creeping stems and branches decked with pink and white blossoms.

On the south shore *Triticum caninum*, *T. junceum*, *Psamma arenaria*, *Blysmus rufus*, *Juncus compressus* and its var. *cænosus*, *Scirpus maritimus*, *Carex binervis*, *C. muricata*, *C. flava*, *C. ovalis*, *Spergularia marina*, *Honckenya peploides*, *Glaux maritima*, *Erodium cicutarium*, *Salsola Kali*, *Cakile maritima*, and others, were got.

On the railway banks were plenty of *Lychnis vespertina* and *Lepidium Smithii*, and at one part near Barassie Station, *Campanula rapunculoides*.

In Fullarton Woods the rare orchid *Goodyera repens*, and the lesser winter-green (*Pyrola minor*) occur.

On the Ballast Bank, land shells occur in great quantities, amongst which are to be found *Bulimus acutus* and its var. *bizona*, *Helix virgata*, *H. aculeata*; and, under the stones close on the shore, *H. aspersa*, along with abundance of the common slater (*Porcellio scaber*), and here and there the pea-slater (*P. armadilloides*) which rolls itself up into a ball when touched.

The Glasgow Autumn Holiday, 3rd October, 1889, was spent by forty-four members of the Society in the Mauchline district, the estate of Barskimming being first visited. Here, for a considerable distance, the Ayr Water has cut a deep ravine through the red sandstone rock, the rich warm brick-red colour of the rock at many parts contrasting finely with the autumn tints of the decaying foliage. A path leads along the right bank of the river, and much to the convenience of the sight-seer, tunnels have been cut out of the rock, at a short distance above the level of the water. *Senecio saracenicus* is eminently a Garnock Valley plant, but here about a score of rather weak specimens of it may be seen growing on the right bank of the Ayr. *Bromus asper*, *Epilobium angustifolium*, and *Viburnum Opulus* were found growing in the wood. Fungi were abundant, the chanterelle (*Cantharellus cibarius*), a good edible species, and one not generally common in Ayrshire, being conspicuous. Near the new bridge in the policies there is a tree of considerable size which was considered to be the Norway maple (*Acer platanoides*), with short trunk, the

branches forming a cup-shaped outline, a feature characteristic of the mode of branching of an allied species, *Acer macrophyllum*. A spindle tree (*Euonymus europæus*) in fine fruit was much admired, the brilliantly coloured pericarp contrasting strongly with the rich orange hue of the arillus on the enclosed seeds. The Ayr is, generally speaking, a rapidly-flowing stream, so is the Lugar, but their point of meeting is solemn and quiet enough, although they owe this feature to the artificial dam above Barskimming Bridge. Near this a "late plant" of the barren strawberry (*Potentilla Fragariastrum*), in full flower, was observed.

After passing the hamlet of Rodingloft at some distance, part of the Lugar Valley was traversed, and red rocks, similar to those seen at Barskimming, were observed. Here the Lugar has cut a deep narrow ravine through the red rocks, and the section is supplemented by an exposure of the trap series under them.

Near Auchinleck House gardens a finely-grown spreading Spanish chestnut (*Castanea vulgaris*) was measured, the trunk being 13 feet in girth at 4 feet 9 inches.

A return to Mauchline was made by way of the Howford Bridge, the celebrated sandstone quarries being visited.

The district traversed during this excursion being an eminently well wooded one, the brilliant autumn tints formed one of the principal features of the landscape.

Another Mauchline excursion took place on Saturday, 1st September, 1894, the time proving rather unfavourable as to weather. After visiting the extensive Ballochmyle red sandstone quarries, and inspecting the stone-cutting machinery, the party proceeded to King-en-Cleuch Castle, and afterwards to the Lily Glen, but as everything was dripping with moisture little could be done in the way of natural history. The "Big Brig" was passed under, and a very interesting part of the programme was the inspection of the curling-stone factory, at the Haugh, where Mrs. Kay, the proprietrix, conducted the party through the works; the fine display of "ice stanes" on the shelves, the machinery, and the varieties of rock used in the manufacture of the stones, excited much interest.

A return being made to Mauchline, the two fine Florence-court Yews (*Taxus fastigiata*) (if indeed they are not older than the specimens at that locality) in Netherplace Garden were inspected

and commanded much admiration, being perhaps the finest pair of this variety in the kingdom. At the ground they measured, on 4th August, 1892, respectively 9 feet 10 inches and 10 feet 2 inches in circumference, and in each case a great number of branches spring immediately from the ground, a feature which has given to this variety the name of *fastigiata*.

The chief geological feature, both at the quarries and in the river sections, was the amount of oblique bedding displayed, shewing deposition by strong currents (possibly of wind, rather than water). The great uniformity in the colour of the rock—a warm brick-red—is exceedingly difficult to account for. The conditions of deposit must have been very different from anything we have in this country at the present day, and from what took place in the carboniferous period, before the Mauchline rocks were in existence. Some bits of the sections remind one of what we see in the blown sands of the Ayrshire coast. Even the coarser grained layers are represented in the blown sands, sometimes quite on the tops of the Dunes. The sandstone deposit will occupy about twelve square miles in a pretty compact area, and is surrounded by a ring of volcanic rocks which, we presume, pass under the whole sandstone area, and were thrown out during the earlier part of the Permian period. These consist mostly of porphyrites and amygdaloids, generally speaking, remarkable for the rapid way in which they disintegrate as seen in recent cuttings through them, such as near Tarbolton Station, where the sides of the recently made railway cutting are already in a crumbling state; and in natural sections cut through them by the Ayr and Lugar Waters at Ballochmyle, near Stair, and on the Auchinleck Estate. The amygdaloids differ greatly from the carboniferous ones by the large amount of saponitic material they contain, and some of them, when polished, have almost as soapy a feeling as some varieties of soapstone. That the volcanoes of the district were active in a certain degree during the deposition of part of the red sandstone, is shewn by the occasional bombs in that rock, several specimens of which may be inspected *in situ* in the railway cutting near the Mauchline end of the Mossgiel tunnel; and at the other end of the tunnel the vent of an old Permian volcano is seen in section in the railway cutting. In a pit sinking through these strata a limestone bed was encountered, specimens of which

were shewn to the Geological Society of Glasgow by Mr. Robert Dunlop, of Ardrie, a short time ago. This limestone was bedded in thin layers, and appeared to contain nothing organic even in microscopic sections. The Geological Surveyors have shewn that before the deposition of the Permian strata in this part of Ayrshire, there had been tilting up of the carboniferous formation and extensive denudation of its uplifted beds, so that between the two formations there had been a long time-hiatus; and when pits come to be sunk through the Permian at different parts, each will have a chance of reaching the coal-bearing beds at different horizons of the latter.

The only other part of Ayrshire where there is a patch of the Permian red rocks, identical with those at Mauchline, is along the Ballantrae north shore, where they extend almost to Bennane Head.

The excursion on the Autumn Holiday, 2nd October, 1890, was to Loudoun and Lanfine, under the leadership of the late Mr. Robert Turner. Arriving at Galston Station, the large party of fifty-two was favoured with a view of Mr. Findlay's collection of agates and Burn Annæjaspers. The former were in great part obtained from the trap quarry of Cowgove, situated a short distance to the south of the town, and the latter from the "pebble holes" on the Burn Annæstream, where large quantities of this very beautiful and unique variety of jasper have been obtained. After having their eyes sufficiently dazzled with the fine sections of the "precious stones" a visit was made to the Boss Tree—the massive but much wasted remnant of an ancient wych elm, out of the hollow interior of which all the new arrivals of children in the village are said to come. This tree, of which an illustration is given—Plate II.—is also known as the Warrior or Wallace Elm, tradition relating that on one occasion Sir William Wallace found refuge from his pursuers in its branches. Under the guidance of Mr. Lyon, the ancient Tower of Barr, situated in the town, and still kept in a good state of repair, was inspected. The large area of the north wall is devoted to the game of handball.

Loudoun Kirk and "Queir" were next visited, after which the party proceeded to Loudoun Castle, the latter being reached after



From Photo. by]

PLATE II.

[John Stewart.

THE BOSS TREE, GALSTON.

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passing along a fine avenue. At the castle the chief object of interest was the fine old yew situated near the south wall, and historical, as under it the articles of union between Scotland and England are said to have been signed by Lord Hugh Campbell. This tree, which is a male, was measured by Messrs. R. M'Kay and J. Renwick, on 1st January, 1890, and found to be 13 feet 1½ inches in girth at about 2 feet, and spread of branches, east to west, 75 feet (see Plate III). Near the little artificial pond some Portugal laurels (*Prunus lusitanica*) were seen which had ripened their fruit, the taste of which had a close resemblance to that of almonds. As related by the Rev. Norman MacLeod in the *New Statistical Account* of the parish, five stone coffins were found in Loudoun Park under a large cairn of stones, and in them were a few cutting implements of stone.

Passing on to Lanfine, a look was taken at the remains of old Loudoun Castle, situated on the Hag Burn. Lanfine is classical ground, owing to the fine collection of trees and shrubs, begun to be formed by a Glasgow Professor of Botany, Dr. Thomas Brown, about the beginning of this century; and here were seen medlars (*Mespilus germanica*) with the fruit large and well formed. As in several other parts of Ayrshire, the *Wellingtonia* appears to grow beautifully at Lanfine. On the Lanfine Estate several antiquities have been found, including a number of coins, arrow-heads and borers of flint, and a serpentine head.

Amongst the wild flowers noted were *Epipactis latifolia*, *Sedum reflexum*, *Campanula hederacea*, *Anagallis arvensis*, and *Meconopsis cambrica*—the latter probably an escape. During this excursion thirty-four species of fungi were collected, amongst which *Hydnum repandum*—a good edible one—occurred.

On the afternoon of Saturday, 15th September, 1894, thirty members visited the Dean and Crawfordland. On leaving Kilmarnock Station the route taken through the town was by the little monument erected to the memory of Lord Soulis, and on by the old quarries at the Dean to Crawfordland Castle and policies. Going as far as the little loch, the party was much pleased with its appearance, there being abundance of potamogetons and the tall plants of the great reed-mace (*Typha latifolia*), rendering this little scene quite charming.

Returning by way of Crawfordland Burn, an examination was made in the face of a small cliff of the curious U-shaped tubes of the strange fossil *Corophioides polyupsilon*, S., occurring here in great quantities, and for a description of which the 9th vol. (Part II.) of the Glasgow Geological Society's *Transactions* may be consulted. Crossing the fields to Assloss, an inspection was made of the quaint little fortlet—now used as a milk-house—erected by Jacob Auchinloss in 1543, a time rendered troublous by the fitful border warfare between England and Scotland.

Returning again to the Dean, we passed the old quarries, and in the burn here, which flows at a much higher level than the water in the quarries, there is an oil shale bed, rich in fossil fish remains. The old quarries, from which sandstone was at one time worked, have been rendered quite attractive by the judicious planting of trees and by the presence of swans on the water.

The Dean having again been reached, an inspection was made of the old castle, which is in two detached portions, and of the gardens, where the Irish yew has been utilised in forming covered-in avenues. Near to the castle is the "Judas" or Justice Hill, where trials are said to have taken place in baronial times. The old open-cast workings of the main coal, which occur to the south and west of the castle, are mistaken by some for military trenches.

Not many plants were observed during this excursion, but *Epipactis latifolia*, *Berberis vulgaris*, *Lathyrus pratensis*, and *Spiræa salicifolia* were noted, and growing on the walls of the Dean were numerous specimens of the wall pellitory (*Parietaria officinalis*).

Of birds observed the following may be mentioned:—the willow-wren (*Phylloscopus trochilus*), many swallows (*Hirundo rustica*), martins (*Chelidon urbica*), and in the woods a number of coal-tits (*Parus britannicus*).

On Saturday afternoon, 7th September, 1895, an excursion was made to Rowallan and the Buston Crannog, *via* Kilmaurs.

Passing through the town, which was at one time famous for its cutlers, a peculiar race of men who are said to have been brought from Damascus (a swarm from the Kilmaurs colony is stated to have planted Sheffield as an edge-tool manufacturing town), we observed the remnants of the "jugs" attached to the old court-

house and jail, Kilmaurs having been made a Burgh of Barony by James V., at the instance of Cuthbert, Earl of Glencairn, and his son William, Lord Kilmaurs.

Taking the Fenwick Road, we pass the out-crop of a thick post of trap which covers a large area in this district. Arriving at Rowallan, an inspection was made of the old castle both outside and inside. It has been thus described :—

“The main front with staircase and double turrets, still in good preservation, over which the royal arms of Scotland, fully blazoned, are carved, with the shields of the Comin family (from whom the Mures claim descent), and the Rowallan crest, was built by John Mure of Rowallan and Margaret Cunninghame his wife, in 1562. The oldest portion, however, is of much greater antiquity, dating probably from the thirteenth century, and is supposed to have been the birthplace of Elizabeth Mure, queen of Robert II. of Scotland. There is some old carved wood-work to be seen in the castle.”

Some fine box trees are said to have been at one time in the grounds, but they were all cut down during the night and carried off by the fiddle-pin makers of Kilmarnock. Some holly trees of a fair size still exist. A small dinan or earth fortlet was at one time to be seen a short distance further up the stream, but it has been totally destroyed.

The party afterwards proceeded to the Buston Crannog, where many of the oak piles and beams belonging to that ancient lake-dwelling and fort were seen lying about. An account of its exploration will be found in vol. iii. of the *Archæological and Historical Collections relating to the Counties of Ayr and Wigton*, many of the antiquities got in connection with it being figured. An oak canoe, 22 feet in length, was amongst the finds; and the following relics have been recorded :—Of stone, 29 articles; bone, 32 articles; horn, 2 articles; wood, several bits shewing workmanship; iron, 28 articles; bronze, 3 articles; brass, several pieces; gold, 3 articles; vitreous paste, 3 articles, and bits of dark slag; glass, 3 fragments, bright green; pottery, a bit of Samian ware, 4 other bits, 2 crucibles, and pieces of another crucible with drops of gold adhering to it. The animal remains found consisted of the bones of oxen, sheep, pigs, red-deer,

roe-deer, and geese. A number of other articles was picked up by visitors from the spoil-heaps.

Leaving the Crannog, the old moat hill at Castlehill, opposite Lainshaw, was visited ; and from it a view of Carn Duff was got, where three urns, containing burnt human bones, were at one time dug up.

An excursion to the Eglinton Castle Policies, near Kilwinning, took place on the 14th September, 1889. Outside the policies, and near the Weirston Gate, a small tree of the cork-barked, or, as it is called in the district, the crocodile-elm (*Ulmus montana* var. *major*), was examined. The first year's shoots of this variety of elm are hairy, after which they begin to develop the peculiar corky excrescences. Near Lady Jane's Cottage there is a large tree of the simple-leaved ash (*Fraxinus heterophylla*), and to the south of the gardens, in the woods, a large healthy patch of the asarabacca (*Asarum europæum*). Trained for the most part to the south wall of the flower garden (this wall has now been partly removed) were *Garrya elliptica*, *Rosmarinus officinalis*, *Salisburia adiantifolia* (introduced from Japan, but which grew luxuriantly in Scotland during the Miocene period), *Pernettya mucronata*, *Myristica fragrans*, *Magnolia* (in flower), the poet's laurel, and others. Specimens of the flowering ash (*Ornus europæus*), ever-green oak (*Quercus Ilex*), variegated oak and hawthorn, and the heterophyllous beech were also examined. In the Bullock Park the size and beauty of the Spanish chestnuts, which sometimes ripen their fruit, were much admired. Here are also some beeches of large size and fine growth—one measured being 16 feet 9½ inches in girth at 4 feet 6 inches. In this park there are also a Cedar of Lebanon (*Cedrus Libani*), a strangely-grown oak with very gnarled bole, and many other trees.

On Saturday, 14th May, 1892, the Society visited Cleaves Cove and Blair Policies. Passing from Dalry Station eastwards, the bridge over the Bombo was soon reached. A short distance above the bridge there is an old limestone quarry where road "metal" was for a long time worked, and in some of the beds of which numerous fossils were to be obtained. The shale under the limestone, a section of which can be examined at the little waterfall close by, is also very fossiliferous, containing many fine

lamellibranchs and gasteropods. At Blair School the tops of a fine series of dolerite columns were inspected. This dolerite covers about four square miles of area in the Dalry district, and is in two beds, having an aggregate thickness of about twelve fathoms. Between this point and the Cove a 1200 feet hitch (fault) was passed over, but no perceptible break could be observed as having been made by it on the surface features. At Cleaves a portion of a large trap dyke, in which a quarry has been hollowed, was inspected; and this dyke was again seen at its full thickness cutting through the ash beds in the Cleaves Glen, near to the spot where a cholera victim was buried.

The neighbourhood of Cleaves Cove having been reached, a stand was made at a convenient spot, and, the day being exceedingly fine, a grand view was obtained of the Arran peaks and the hills beyond Dalry and Kilbirnie. After this the Cove was entered, and the strange and sometimes fantastic manner in which it had been carved by natural forces out of the limestone rock was much admired. The Dusk Water, which now runs in the glen at some distance below the level of the Cove, at one time flowed through the passages, as was well made out during its exploration, and at that time the cave was inhabited by a primitive race of men using stone, bone, and horn implements and weapons. For a detailed account of it see the *Transactions* of the Glasgow Geological Society (vol. vii., part ii.), the *Archæological and Historical Collections relating to the Counties of Ayr and Wigton*, and the *Stalactites and Stalagmites of the Cleaves Cove*, by the writer, may also be consulted.

The party afterwards proceeded down the Dusk Glen and inspected some beds of red and green volcanic ash which lie below the lower limestone series, and in which are many small roundish bombs or nodules of exceeding toughness, shewing a beautiful microscopic structure. The glen at parts was all aglow with wild hyacinths; and other plants were noted, especially the black hellebore (*Verbasum nigrum*), which is established in the glen, in some years flowering freely and attaining a great height.

Blair Policies having been entered, many fine trees were examined, some of them being photographed and measured. Amongst them were two hornbeams in leaf and catkin; a plane tree, at east corner of the house, was 12 feet 6 inches at 3 feet

5 inches; an ash, 100 yards east of house, 12 feet at 2 feet 5 inches; and near it a beech, 13 feet 9 inches at 3 feet 6 inches. On the west side of the Bombo a female yew was 9 feet 7 inches at 6 inches, and 8 feet 9½ inches at 4 feet; and a copper beech 8 feet at 4 feet. The fine large great maple beyond the south-west corner of the house has since been blown down. It measured 11 feet 6 inches at 3 feet 5 inches, and had 167 rings of growth. There were also inspected some well-grown conifers, including *Wellingtonia gigantea*, *Pinus strobus*, *Abies lasiocarpa* and *Cedrus Deodara*. During the excursion—which included a walk along part of the Garnock Water, where some large clumps of *Senecio saracenicus* were seen—nearly forty-six plants were noted in flower. The aliens *Alchemilla alpina* (var. *conjuncta*), *Thalictrum minus*, and *Echium vulgare*, were also observed.

On 5th October, 1895, in conjunction with the Natural History Society of Glasgow, a Fungus Foray, under the leadership of Professor Thos. King, was made to Blair Policies. Fungi did not appear to be at all common, still, after a diligent search, fifty-eight species were gathered, the most noteworthy being *Agaricus mutabilis*, *A. clypeatus*, *Polyporus giganteus*, *Leptoglossum viride*, *Helvella crispa*, *Leotia lubrica*, and *Peziza micropus*.

The gardens and museum were visited and some interesting specimens of fossil trees examined, amongst which is a very fine one, shewing the manner in which *Sigillaria* formed its roots, four main roots going off from the trunk, each of these roots bifurcating—a method of rooting not known to occur in any other plant, either fossil or recent.

The excursion of 9th of September, 1893, was to Dalry, the destination being Hindog Glen. Twenty-five members attended, and as the district is a good one in many ways, especially in the display of fine geological sections and abundance of fossils, the ramble on this occasion was much enjoyed.

The route lay through the town of Dalry, which is built on a large hillock situated in the Garnock Valley, and Hindog Glen was entered a little above Cunningham B/aidland Farmhouse, opposite a high cliff of alternate beds of hard and soft volcanic materials. This cliff is formed by a unique feature in the physiography of the district. At every other part of the Rye

Valley the surface of the land dips, sometimes gently, sometimes steeply, towards the stream; but at this cliff, which is opposite Whitecraig (the Warrior's Rock) Farm, on the east side of the stream, the land rises somewhat steeply towards the cliff. Moreover, Hindog Glen from this point downwards presents high cliffs of rock, sometimes on one side of the stream, sometimes on the other, and it is quite apparent that this gorge is all of post-glacial formation, and that the old pre-glacial line of the Rye Valley was placed at a short distance from it towards the east, and is now apparently filled with boulder clay. Proceeding down stream, the party examined the thick beds of agglomerate which form the upper member of the hill series of rocks, for although the hills are now *above* the level of the valley, still their geological position is *below* the strata of the latter. Above the agglomerates come thin fossiliferous shales, the first evidence of returning life to the district after the long period of the hill traps had passed away. This shale is succeeded by the Campsie coal, seen in the glen (but a thin seam in this quarter), and then come the lower limestones and their accompanying shales, the upper limestone post being finely developed and well exposed in the Cunningham B~~f~~aidland Quarry, where the party had an opportunity of seeing myriads of fossils exposed on the weathered faces of the rock. Towards the old kiln there is a fine quaquaversal dip in this limestone, the only one we can point to in Ayrshire. On the other side of the stream from this, just opposite the Aitnock Well, the blackband ironstone was seen, its position being some fifty-four fathoms *above* the limestone in the quarry, the line of the glen at this part being placed on a large hitch (fault). Aitnock Fort, situated on the top of a high sandstone cliff which rises sheer up from the waters of the Rye, was next visited, after which the party proceeded down the glen keeping the right hand side, passing the outcrop of the Linn limestone, and examining a synclinal bend in the strata. A capture was here made of what was supposed to be the water shrew (*Sorex fodiens*), but it escaped before this point could be fully determined.

The return was made towards Dalry by way of Doggartland, the old mill-lade and dam at that place being fringed with an extraordinary profusion of *Mimulus luteus* (musk), which in its season makes a splendid show. At "the bugs," now in the Dalry

Park, an opportunity was afforded of examining the tall strong plants of *Poa aquatica*, this being its only Ayrshire station. The excursion may be said to have terminated on the old shale-heap above and beside the remnant of the old Court Hill, from which coign of vantage a magnificent view is obtained of the Garnock Valley.

On the 27th May, 1893, twenty-one of the members visited Kilbirnie and Glengarnock old Castle. The old Parish Church, situated in the level haugh of the Garnock, was inspected on the way, and the carving on the gallery and above the pulpit—remnants of what once existed in this church—was much admired. In the churchyard was seen the tomb of Crawford, the bold captor of Dumbarton Castle. Passing through the town of Kilbirnie, the party again crossed the Garnock, and held by the road which leads to Glengarnock Castle, noting by the wayside a large number of the plants of *Mimulus luteus* in the ditches.

The Castle of Glengarnock stands on a jutting peninsula of rock high above the waters of the Garnock, which here makes a loop partly round it, and evidently at one time was defended on the land side by a dry ditch. From here a considerable view is obtained up the deep unwooded part of the glen, the slopes of which lie at a very different angle from what they do at and below the castle, the latter ravine having evidently been cut out of the rock since the glacial period, the old pre-glacial glen of the Garnock at this part being apparently now at some distance to the north-east of the present glen, and in all probability filled up with boulder clay. On a bank beside the castle there is a great quantity of the masterwort (*Peucedanum Ostruthium*).

After inspecting the castle, our course lay down the bottom of the glen, and as this is not often traversed, the vegetation was of the most luxuriant and fresh description. A thin vein of barytes was seen cutting through the trap, and here and there great beds of garlic (*Allium Schœnoprassum*). The banks were covered with the beech and the oak ferns, and at parts the damp rock faces with the filmy fern (*Hymenophyllum Wilsoni*). The glen being well shaded with wood, its recesses at parts are dark and solemn, many deep brown pools, the safe retreats of the finny tribe, having been cut out of the softer parts of the rock.



From Photo. by]

PLATE III.

VIEW AT LOUDOUN CASTLE.

John Stewart.



Amongst the other plants detected were *Cardamine amara*, *Lysimachia nemorum*, *Geranium sylvaticum*, *Senecio saracenicus*, *Asperula odorata*, *Melica uniflora*, *Milium effusum*, and the tender fronds of *Cystopteris fragilis*, which generally selects the shelter of some overhanging cliff for its habitat. Where the glen begins to debouch on the open plain, a magnificent display of broom in fine flower was observed.

Thus far we have occasion to congratulate ourselves on successful "raids" into Ayrshire. But we have by no means exhausted the geological, physiographical, or natural history resources, or antiquities of this large western shire, and much interesting ground still remains to traverse and explore.

VI.

WASTE GROUND AND SUBURBAN BIRD-LIFE :

A GLASGOW STUDY.—II.

BY JOHN PATERSON.

(*Paper read 4th December, 1895.*)

ON three previous occasions I have communicated to the Society notes on the bird-life of a comparatively limited area within the city's boundaries as presently defined. The results of the first and second reports on the ornithology of the district have been recorded in the first volume of the *Annals* of the Society (pages 118-127), and the purpose of the present paper is to bring my observations to a point, the third report being included with the present notes.

The boundaries, as first defined, are now extended on the west to include Camphill Grounds, which have been added to Queen's Park, and the city boundary on the south-east is now followed so as to embrace Mount Florida. As published, the list included forty-nine species ; it now extends to sixty-nine.

Coming now to the additions to the previous list, the redstart (*Ruticilla phoenicurus*) has occurred on migration both in spring and autumn. I observed it at Hangingshaw in April of this year (1895), and during the past two autumns I have seen it about the camp in Camphill from the last days of July until the beginning of September. The golden-crested wren (*Regulus cristatus*) may be seen occasionally in autumn and winter in the Park. It is a familiar little creature, and will allow an observer to approach within a yard or two. The wood-wren (*Phylloscopus sibilatrix*) occurs, I believe, in autumn in the company of the spotted fly-catcher, but there may be some confusion here with the yellow young of the willow-wren.

The tree-creeper (*Certhia familiaris*) was observed in the Park last April by Mr. H. B. Watt.

The white wagtail (*Motacilla alba*) has occurred during the spring migration.

The spotted fly-catcher (*Muscicapa grisola*) is seen in parties, ranging up to about thirty birds, every autumn in Camphill and the Park, where its habits may be easily studied.

The linnet (*Linota cannabina*) has now been ascertained to occur regularly each autumn, and sometimes in winter, in small numbers on waste ground at Hangingshaw.

The corn-bunting (*Emberiza miliaria*) has occurred within our limits, near the southern boundary. This is a rare bird in East Renfrewshire in the experience of my friends as well as of myself, and Mr. Morris Young tells me it is surprisingly scarce around Paisley. It occurs sporadically, however, in Lanarkshire, near the city, as at Possil, Cambuslang, and west of Rutherglen. The severe weather in January, 1895, brought the snow-bunting (*Plectrophenax nivalis*) to our doors, a flock of about a hundred having been observed at Hangingshaw by Mr. H. B. Watt.

For a notice of the occurrence of the magpie (*Pica rustica*) I am indebted to Mr. Robert Wilson, who observed one at Hangingshaw in the autumn of this year.

About two years ago, in midwinter, Mr. Richard M'Kay told me, that on the afternoon of the day on which he reported the occurrence, he had had his attention drawn to an owl sitting on a stack at Clincart Farm, Mount Florida. I have no information regarding the species, but as it was daylight when it was observed, it may not unlikely have been the short-eared owl (*Asio accipitrinus*).

The kestrel (*Falco tinnunculus*) has been observed several times. Within the past year I have twice seen at Mount Florida the common heron (*Ardea cinerea*) flying overhead. The mallard or wild duck (*Anas boschas*) I have also seen twice in the district, passing over at a low elevation.

A teal (*Querquedula crecca*) appeared at the Hangingshaw clay-hole ponds in the past autumn, and though much disturbed it remained for a week or two.

The common curlew (*Numenius arquata*) I have once observed passing over Polmadie. A single example of the common gull (*Larus canus*) has come under my notice in the recreation ground, east of Queen's Park. The herring-gull (*L. argentatus*) is seen in

flocks of varying size in midwinter, but the lesser black-backed gull (*L. fuscus*), although numerous in Glasgow harbour during part of each year, has not yet been noticed in the district.

A young kittiwake gull (*Rissa tridactyla*) was observed by Mr. H. B. Watt and myself on the 17th of November, 1895, after heavy weather. It is the first live bird of this species that has come under our notice in East Renfrewshire.

A pathetic interest attaches to the last addition to the list, the little grebe (*Podiceps fluviatilis*). Mr. Robert Wilson tells me that in September, three years ago, a little grebe was noticed early one morning on the pond north of the curling pond at Hangingshaw, and soon attracted the usual polite attentions of the young barbarians of the neighbourhood. After a protracted hunt the poor grebe was harassed to death.

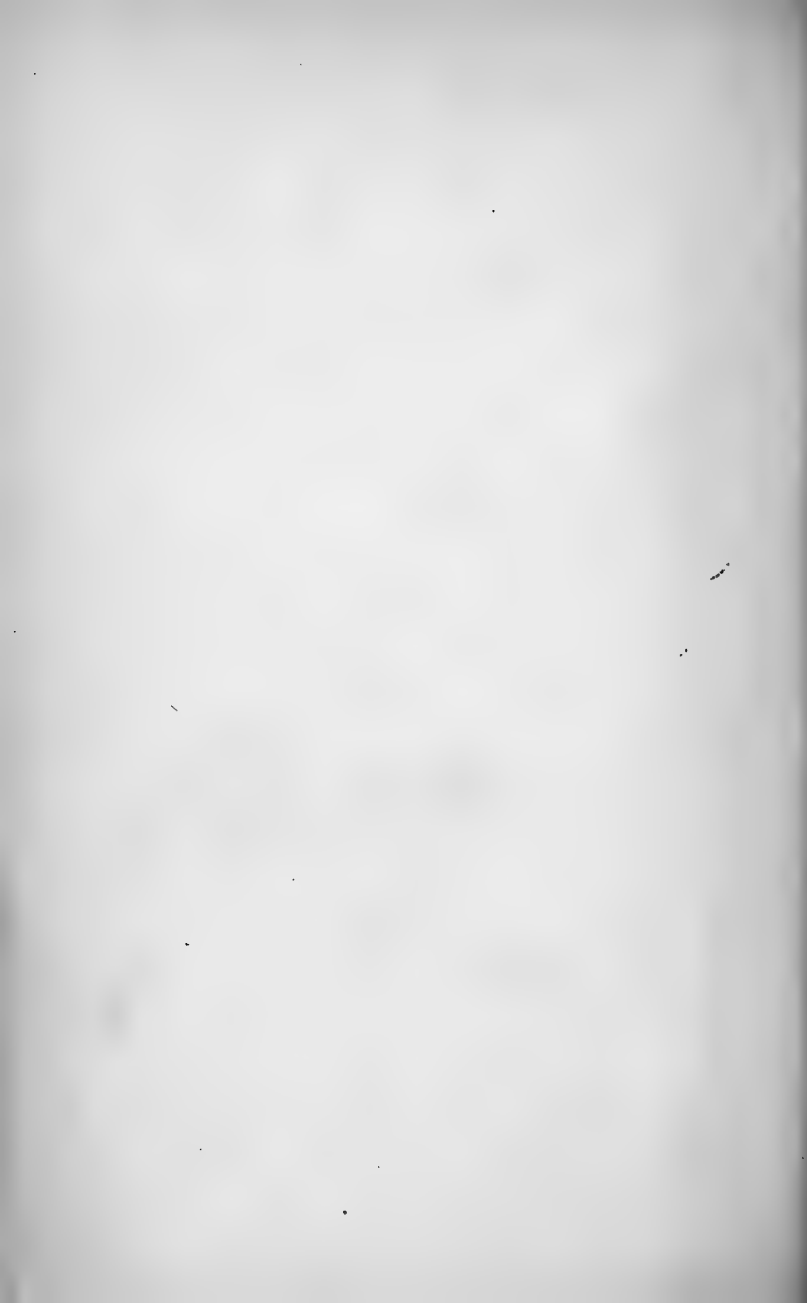
Regarding the species previously recorded for the district, a few notes are necessary. The redwing (*Turdus iliacus*) and fieldfare (*T. pilaris*) continue to appear regularly in winter. This autumn I saw both species in Queen's Park in the last week of October. The goldfinch (*Carduelis elegans*) has been seen by others as well as myself on three or four occasions about Hangingshaw. The rook (*Corvus frugilegus*) continues to nest in the locality near Crosshill Station before mentioned, while the inclusion of Camphill in our district adds another rookery of fair size (numbering over twenty nests) to our area. The kingfisher (*Alcedo ispida*) I have only once seen here since the last series of notes was published. I heard the cuckoo (*Cuculus canorus*) during the past summer in Crosshill, and have been credibly informed by others of its occurrence there this year. The sparrow-hawk (*Accipiter nisus*) continues to be seen, in autumn especially, while the corn-crake (*Crex pratensis*) is represented in summer by several pairs.

Although the list for the district is more than double what it was when first presented to the Society, there are still a few species which may reasonably be expected to be added as the result of continued observation. A district like the one described has its disadvantages, still it is well situated for the observation of the migratory movements of a number of species. The breeding birds being well known, others which appear in spring and autumn are at once recognised as birds of passage pursuing their "hedge

to hedge" migration, and the district thus presents to the observer some of the advantages of a strictly isolated position.

For reference, a complete list of the birds observed till date is here appended :—

- | | |
|----------------------------|-------------------------------|
| 1. Mistle-Thrush. | 36. Corn-Bunting. |
| 2. Song-Thrush. | 37. Yellow Bunting. |
| 3. Redwing. | 38. Reed-Bunting. |
| 4. Fieldfare. | 39. Snow-Bunting. |
| 5. Blackbird. | 40. Starling. |
| 6. Wheatear. | 41. Magpie. |
| 7. Whinchat. | 42. Jackdaw. |
| 8. Redstart. | 43. Rook. |
| 9. Redbreast. | 44. Sky-Lark. |
| 10. Whitethroat. | 45. Swift. |
| 11. Golden-crested Wren. | 46. Nightjar. |
| 12. Willow-Wren. | 47. Kingfisher. |
| 13. Wood-Wren. | 48. Cuckoo. |
| 14. Sedge-Warbler. | 49. Owl (sp. ?). |
| 15. Hedge-Sparrow. | 50. Sparrow-Hawk. |
| 16. Great Titmouse. | 51. Kestrel. |
| 17. British Coal-Titmouse. | 52. Common Heron. |
| 18. Blue Titmouse. | 53. Mallard or Wild Duck. |
| 19. Wren. | 54. Teal. |
| 20. Tree-Creeper. | 55. Ring-dove or Wood-pigeon. |
| 21. Pied Wagtail. | 56. Pheasant. |
| 22. White Wagtail. | 57. Corn-Crake or Land-Rail. |
| 23. Grey Wagtail. | 58. Moor-hen or Water-hen. |
| 24. Yellow Wagtail. | 59. Golden Plover. |
| 25. Tree-Pipit. | 60. Lapwing. |
| 26. Meadow-Pipit. | 61. Common Snipe. |
| 27. Spotted Fly-catcher. | 62. Common Sandpiper. |
| 28. Swallow. | 63. Redshank. |
| 29. House-Martin. | 64. Common Curlew. |
| 30. Sand-Martin. | 65. Black-headed Gull. |
| 31. Greenfinch. | 66. Common Gull. |
| 32. Goldfinch. | 67. Herring Gull. |
| 33. House-Sparrow. | 68. Kittiwake Gull. |
| 34. Chaffinch. | 69. Little Grebe. |
| 35. Linnet. | |



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VII.

THE BURIED, OR DRIFT-FILLED CHANNELS AND GLENS: AND THE POST-GLACIAL GLENS OF AYRSHIRE.

BY JOHN SMITH.

With a Map and Five Diagrams by the Author.

(Paper read 5th May, 1897.)

DURING my examination of the Ayrshire drift formation, in going up or down the various stream courses I was constantly passing from parts of the valleys where banks or scaurs of drift, sometimes reaching to as much as 100 feet in vertical height, occurred, into other parts where there was little or no drift at all, but where the streams had cut deep narrow gorges through rock, with more or less perpendicular walls. These features, presenting themselves so often, led me to take special notes, and I soon found that the rocky gullies were clearly post-glacial, and that to one or other side of them there was a pre-drift glen. I say pre-drift advisedly, as there are possibly no pre-glacial glens in Ayrshire, correctly speaking, all of them, apparently, having been increased in size during the early part of the glacial period by glaciers, the pre-drift glens being filled up with boulder clays and intercalated beds of sand, gravel and laminated clay; sometimes these latter beds lying on the rock, and the sands and gravels occasionally capping all, but oftener this position is occupied by boulder clay. After a little practice it became quite an easy matter, generally speaking, to tell to which side of the streams the filled-up glens lay. If, for instance, on going up a stream, rock would appear on the right-hand side, the drift continuing for some distance on the left, then the drift would disappear, and finally the river was rock-bound on both sides; the filled-up valley in this case would be on the left side; and in getting out of the rocky gorge the drift would again appear, first on the left side, the rock continuing for

a short distance further up on the right. Before entering the recent rocky gorges, the glens or valleys have, as a rule, gently sloping rocky sides, as is seen where they have been bared of drift. In the gorges, the rocky sides, as already remarked, are often wall-like and perpendicular.

It is easy to see how the streams and rivers have left their old drift-filled glens and formed new rocky ones.



Fig. 1. Theoretical Section of old & new River Channels

Let us suppose A B C (*Figure 1*) to represent the section of an old glen, which during the drift period was filled up with marine deposits to the height of the line A C, perhaps a hundred feet above the line of the old channel at B. On the re-emergence of the land the stream may have commenced to cut a new channel at any part on the line A C. If it commenced close to A, it would cut out the rocky gorge A D E; and this is just what we find the Ayrshire streams have often done. Should it have begun near the middle of the line A C (which in the majority of cases it has done), we will have a glen (or part of one) in drift with a moderately sloping side and a steep side, as represented by the dotted lines above B; and, as drift is more easily excavated than rock by a river, this glen may be a quarter of a mile or more wide.

No one can say for certain (unless where both sides of an old rock-glen have been laid bare) that any Ayrshire stream has done much rock-cutting in the bottoms of the old glens. My impression, after a good deal of examination of stream courses, is that the bottoms of the old glens remain mostly covered with drift, these channels having perhaps been the beds of sub-glacial rivers; but few Ayrshire streams appear to run, in many places, exactly in the lowest part of the old glens. That there are a number of rock-bound hollows in Ayrshire,—like the area in which Loch Doon lies,—partly or entirely scooped out by glacier ice, is quite possible; but the rocky gorges I am about to describe have not been cut through barriers to such hollows, the only rocky barrier

I know of in Ayrshire being the one cut through by the Doon, and forming the long, narrow, deep, picturesque, Ness Glen.

OLD CHANNELS.

Skelmorlie Glen.—About the middle of the glen on its south-east side, there is a prominence capped by what appears to have been an old fort defended by a ditch, the curious thing about it being a fragment of a stone wall, the lime having been tempered with sea shells. A short way above this, the Skelmorlie Burn runs for some distance through a rocky gorge excavated in calciferous sandstone. From this glen being so much wooded it is not easy to make out on which side the old filled-up glen lies, but it is possibly on the north-east. Above the rocky gorge the burn has cut deeply into the drift.

Garnock Water.—Just above Glengarnock old Castle, the glen of the Garnock shows a considerable quantity of drift, especially on its east side, and the slopes of the glen where cleared of drift are normal, that is they are not perpendicular, like the sides of post-glacial glens cut by streams, but present appearances more or less sloping, any pre-glacial scaurs having been modified by glaciers, striæ being seen sometimes on vertical faces of the rock, but these exposures are not high. From the point mentioned, where the drift is thick, downwards, somewhere about the line of Blackburn and Millside Houses, the old drift-filled channel must run. At the old castle the Garnock wheels suddenly to the right, then to the left, and runs through a post-glacial rock-bound gorge of trap for a considerable distance. This gorge being difficult to traverse from its narrowness, and the deep rocky pools it abounds in, is a happy sanctuary for some of our more delicate ferns, mosses, and other plants, the display of garlic flowers in their season being magnificent.

Opposite Smithstone, Dalgarven and Monkcastle, rock appears in the bed of the Garnock. It forms no cliffs, not even small ones. I used to consider the hollow in the Garnock Valley between Dalry and Kilbirnie Loch (and further on by Loch Semple), now filled with lake deposits, as having been scooped out by glacier ice, but it is quite possible that there is an old buried channel partly in line of the present one at Kilcush, and to the east of it at Groatholm, which drained the now filled-up part of the valley.

Paduff Burn.—The Paduff cuts through a considerable quantity of rock, and, below the falls where it leaves the hill traps and cuts through stratified beds of the lower limestone series, there is a bank of boulder-clay on its left side. Below this it runs mostly on rock till it comes to the Kilbirnie-Largs Road; above this road it has cut a considerable glen through rock, and here there may be an old glen, but on this point I am not perfectly certain.

Rye Water.—The Rye Water between Whitecraig and Cunningham Baidland, and for a considerable distance further down, runs in a post-glacial rock-cutting, in agglomeratic tuff, limestone, shale, and sandstone, the romantic Hindog Glen, with fort-capt Aitnock Craig, facing the famous limestone quarry of Cunningham Baidland, being about the centre of it. A great peculiarity of the geological features here is the fact that the Whitecraig Rock (it is not white, white being a mistranslation of the Gaelic word for a warrior, who may have had a fort here) rises towards the present glen, and looks as if its landward slope formed part of the side of the old glen (*See Figure 2*), as it cannot be placed on the Cunningham Baidland side, that side being evidently all rock.



Fig 2, Whitecraig Rock, Rye Water.

On the left side of the Rye, above Whitecraig, a great 70-feet bank of drift is seen, which at the present time is constantly slipping, as the base of it is being cut away by the river. The old drift-choked glen appears to extend from this point to about the position of the targets, opposite Ryefield. In the neighbourhood of Doggartland, the Rye again cuts through rock to a small depth.

Caaf Water.—The Caaf above Birkhead Glen shows deep drift, but it is difficult to say whether or not there is an old buried glen here. Below Drumcastle Mill the Caaf cuts through sandstone of millstone grit age, and further down a considerable scour of drift appears on the right bank, as if to indicate that the old channel or glen lay to the east of Drumcastle. The old channel may cross the present one here and continue somewhere in the

direction of Linncraigs, as below the drift-scaur the Caaf flows in a rock-bound glen till some distance below the Linn Spout, where it falls over a high ledge of upper limestone.

Dusk Water.—The Dusk Water, from the great sandstone rock at Ravenscraig (largely quarried now), runs for a considerable distance through a rocky gorge, known in part as Cleaves Glen, and in which the limestone cavern of Cleaves Cove is situated. A study of the district leads me to think that the old valley of the Dusk runs from between the Blair Tile Work (site) and Ravenscraig, and to the west of Cleaves, joining the present valley above Waterside. What lends particular emphasis to this view is the manner in which the upper part of the large trap-dyke has been cut off abruptly at Cleaves Cot, and in the hollow to the north of this, the present stream cutting through this dyke near to the solitary grave in the glen. The eastern side of the old glen is bounded in part by the said dyke for a short distance to the south of Cleaves Cot, and its western side partly by a prominent escarpment of trap; between the two there being a long drum apparently of drift, very likely carried out by the last land ice. (See Figure 3.)



Fig. 3, Dusk Water.

Lugton Water.—The Lugton Valley at the Sevenacres Mill (pronounced "Snakers") has rock on its west side and drift on its east. Above and below this there is rock on both sides. The drift at "Snakers" is where the present rock-bound stream has made a breach through on to the side of the old valley by turning suddenly to the left for a short distance, and as suddenly back again. The old valley appears to run somewhere near Montgreenan and Fergushill.

The Lugton in its lower reaches at present wheels to the west and flows into the Garnock, but at one time it may have run to the Irvine, as there is a drift-filled underground glen which forms a continuation of it in that direction.

Annick Water.—The Annick above Stewarton has scaurs of boulder-clay. It leaves the old valley, and, at the north end of the town, cuts through white crumbling sandstones. The old valley is some distance to the east of the rock-bound cut. Below the town it cuts for a bit into lower limestone strata.

Fenwick Water.—On the Fenwick ("Finic"), above and below Dalmusternock, there is a thick clay-and-stones deposit over 40 feet deep—base not seen. Lower down the burn has cut through rock for a bit, having left the line of the old valley, which is probably further to the east.

Crawfordland Water.—Some distance below Craigendunton the Crawfordland leaves the old valley and cuts through trap rocks, ash-beds, amygdaloids, and at a small waterfall there is a solid trap-sill in clean-cut columns. At parts the drift is seen on top of the trap—more in force on the south side of the burn—showing that the old glen lies to that side. At Craigendunton Water Works the old glen was got in the puddle trench, with the following section—

Boulder-clay, up to	-	-	-	40 feet thick.
Sand and gravel,	-	-	-	5 "
Laminated mud,	-	-	-	3 "
Rock, amygdaloidal trap.				

A considerable quantity of fine water flowed from the sand-bed in the puddle trench, which shews that it (the sand-bed) must extend for some distance, and outcrop from beneath the boulder-clay, probably further up the valley.

The scenery about Crawfordland Bridge is rather pretty, the stream here having left the line of the old drift-filled glen, and cut mostly through sandstone, the tree-shaded defile with its deep, sullen, rocky pools forming a great contrast to the one-side scaur—landscape or grass-grown slopes of the "drift" formation. A short way below the bridge, a sandstone bed is to be seen which, in a distance of eight yards, thickens from a "knife-edge" up to six feet.

Hareshawmuir Burn.—This stream leaves the old channel or glen above Langdyke and cuts through various rocks, including a 40-yard trap-dyke, not shown on the one inch survey map. On the

south-east summit of the dyke there is an old fort, but without ditches, the old fort-builder having evidently not been able to dig into the trap. The old channel or glen probably lies somewhere between the present stream and the Pockinan Burn.

Polbairn Burn.—Opposite Alton Muirhouse the Polbairn leaves the line of the old glen, and a short distance to the north-west of it cuts through trap rock. Below this it comes into the line of the old glen, and forms drift-scaurs, but again leaves it for short distances in three places—at Castlehill forming a considerable glen.

Glen Water.—Where the glen issues from the wooded rocky gorge of the Carlin's Craig, it has at one time turned to the left, into the old valley, and has carved out an amphitheatre with covenanters' seats, in the drift, where beds of sand and gravel are to be seen on the slopes of the old bank. Above the mouth of Mucks Water we find the stream pretty much in the line of the old valley, and making scaurs 70 feet high in the shelly drift.

Changue Burn.—Below where the Changue joins the Logan Burn, it leaves its drift-scaured valley, and cuts a deep wooded gorge for two furlongs through trap, emerging from it a short distance above the great Score Tulloch scaur, where thick shelly till is capped by about 90 feet of sand and gravel.

River Irvine.—The Irvine keeps better to the line of its old valley than any other large Ayrshire stream, exhibiting but little rock in its channel, and no cliffs of any magnitude.

Cessnock Water.—The Cessnock, near Craighead and Craigmill, cuts deeply into the calciferous series, forming splendid geological sections, the drift-filled valley being probably a short distance to the south.

Avon Water.—The Avon at Main Castle (an old earth-work fort) has left the pre-drift valley, and cuts through rock (metamorphosed old red sandstone of the Geological survey), the old channel being on the west side of the fort and stream. Above Main Castle the Dipple joins the Avon on the Lanarkshire side, coming out of a rocky gully.

Above the moraine (see the *Drift or Glacial Deposits of Ayrshire*, page 67, by the author; *Transactions of the Geological Society of Glasgow*, 1898) the Avon again leaves the old valley, cutting a

deep glen in the rock, the buried glen this time being to the east side of the present one, as is well seen at the head of the rocky glen where a high bank of drift appears on that side, 30 feet of it choking up the mouth of the old valley, the rock continuing for some distance on the other side.

River Ayr.—At Catrine the Water of Ayr has widened out its valley a good bit, forming the hollow in which the town of Catrine is situated. Between here and Ballochmyle “big brig” it has left the old valley, cutting through the trap and sandstone of the Permian formation. It again enters the old valley where joined by the Lugar Water, but soon leaves it again, cutting deeply into the Permian red rocks at Barskimming, where, for convenience of the wayfarer, there are long tunnels (with daylights emerging on the wall of the gorge) cut through the rock along the north side of the stream. A short distance below Barskimming House the Ayr wheels to the left and makes a breach into the side of the old valley deposits, exhibiting a high scour of boulder-clay with a thick sand and gravel bed in its centre, the sand and gravel and lower till containing marine shells. It immediately wheels to the right, and then to the left, and cuts for a long distance more or less through red rocks.

Below Tarholm the Ayr wheels to the N.N.E. for about a mile, cutting through carboniferous rock, then turns to the west and cuts through rock till it comes near to Auchencruive House.

The total length of the rock-gorges of the Ayr (excluding minor features) is about six miles. The old drift-filled valley is mostly to the south of the rocky gorges.

Whitehaugh Burn.—Further up stream than the Garpel Farm steading, the burn has left the old valley and cut a narrow channel through rock, but beyond the rocky ravine it is carving away at the drift deposits in the old valley, and has produced a bit of scenery closely resembling that of the Windy Wizen near Loudoun Hill, but with the great difference of a stream flowing through it. The drift-filled valley is to the east of the rocky gorge. -

Greenock Water.—The Greenock Water above Chapelhouse (a ruin) comes out of a small rocky cut to the left, having here quitted the old valley, but only to a small extent. The drift-filled

glen probably runs from the great scaur—which has slipped so much—near Chapelhouse, in the direction of Aikencleugh. Near here on the south side of the Greenock there are some very old drift landslips caused apparently by springs of water.

Dippal Burn.—The Dippal, before it joins the Slot Burn to form the Greenock, cuts through rock forming a steep-sided little ferny glen. Above this rocky ravine there is a marine shelly drift extending—on the left side of the burn—to 1061 feet above sea level: the highest point I have found marine shells in the drift (*Op. cit.* page 80).

Ponesk Water.—The Ponesk at Cleugh Head wheels round to the left and cuts a deep glen through a felstone ridge. A great peculiarity here is that the hollow between the Ponesk and the Greenock Water is apparently not filled with drift to any extent, and very little damming would send the Ponesk into the Greenock again—its original course.

When the Ponesk commenced to cut through the rocky ridge, the above hollow may have been choked up with ice from Middlefield Law (see paper by the author in *Transactions of the Geological Society of Glasgow*. Volume X., 1896, page 331), and possibly the first river which did the early cutting of this gorge was sub-glacial, as its sides are not so perpendicular as they are in rocky glens of purely river origin.

Guelt Water.—The Guelt above Whiteholm shepherd's house has left the middle of the old valley, and for a short distance cuts through carboniferous shales and impure limestones, the shales being remarkable for the long lengths of crinoid stems they contain. I once here saw a crinoid stem standing erect in the shale. Above its junction with the Clocklowie Burn, the Guelt cuts through sandstone for a considerable distance, and the new glen appears to cross the old drift-filled one.

Glenmore Water.—The Glenmore above Dalblair has cut a deep channel in carboniferous rocks, forming magnificent cliffs, where fine slabs of cocks-tail sandstone are to be seen. Above this the glen opens out again and shows the usual scaurs of drift along the sides of the stream. The old valley of the Glenmore is evidently to the east of the new one, beginning below High Dalblair, and ending near Nether Guelt; the second drift-scaur

on the Guelt Water, counting from its mouth, is probably about the middle of it. At parts the Glenmore shows rock on its west side, and drift on its east, where the old glen has been breached by the present stream.

At the Cubs, the Glenmore has again left the old valley and cuts for a considerable distance and depth through trap, forming the beautiful Cubs Glen, where—in very dry weather—a few rare plants may be gathered, it being quite impassable, from the steepness of its rocky walls, at other times. A large block of impure limestone is seen imbedded in the trap, and a small patch of sandstone is hitched up amongst it in the glen. The stratified rocks overlying the trap at the head of the glen afford a small object lesson in contact metamorphism, and clearly demonstrate the intrusive character of the trap. It has a "Wallace Cave."

Below Wallaceton the water has formed a high cliff of trap by cutting sideways into it, the present valley having been widened out of the drift-series from below Barlonachan. Before it joins the Bellow it again cuts through rock, the old channel being evidently to the south-west of Cubs Glen and the last mentioned rock-cutting.

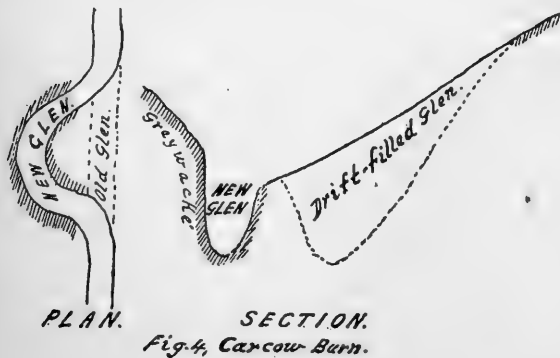
Bellow Water.—Before the Bellow joins the Glenmore it emerges from a deep rocky gorge called Bellow Path. The old channel may be to the west of this, at least towards the east rock is seen rising to the surface for a considerable distance. It was at Bellow Mill near the junction of the two streams that Murdoch made his famous experiments on the Lugar blacks, a variety of very tough carbonaceous shale, which led to his discovery of coal-gas.

Lugar Water.—The junction of the Glenmore and the Bellow forms the Lugar, the latter for the first mile of its course flowing pretty much in the line of the old valley; but, in the neighbourhood of Roadinghead, it makes a few picturesque windings, not in the manner rivers generally do, in alluvial flats, but through a deep rocky glen, well covered with trees, the centre of the old drift-filled valley being evidently further to the south, perhaps running from near Logan House (where the famous laird of that ilk lived) in the direction of the south of Cumnock Town. Between Cumnock and Barturk, below Ochiltree, the Lugar keeps almost entirely to the old valley and has made many scaurs in the drift, some of

them of considerable height, and in the policies of Dumfries House, the plantations, old river-terraces, and alluvial flats in this part of its course, form some rather picturesque scenery. Below the Barturk scaur the Lugar runs between perpendicular walls, first of volcanic rocks—the framing of the Permian sandstone—and then through the Permian sandstone itself, its old valley being some distance from its left bank. Before the Lugar reaches the Ayr it cuts across part of the drift-filled valley of that river, its old scaurs being either covered with grass or trees.

Water of Coyle.—The Coyle from Coylton to its junction with the Ayr makes numerous very picturesque windings, sometimes in deep rocky glens, and in this respect is not rivalled by any other Ayrshire stream. It would take a great deal more study than I have given to unravel the positions of the old drift-filled glens, so that I have not shown any of them on the map. In the neighbourhood of Rankinston it cuts at two places, for a bit, through rock, trap at one part, and coal-measure shales, etc., lower down.

Carcow Burn.—A little distance below the junction of the Glenshalloch Burn, the Carcow suddenly turns to the right and cuts through 20 to 30 feet of greywacke, and immediately turns to the left and again cuts through drift. This feature is well seen, a high bank of clay and boulders standing fair in the line of the old glen. The hill slopes bounding the Carcow here rise steeply up from the old glen (*See Figure 4*).



River Doon.—Ness Glen on the Doon, as has already been remarked, is cut through the rocky barrier of Loch Doon, there not being in this instance any drift-filled glen draining at one time the hollow in which the loch lies. In getting out of Ness Glen, at its upper end, there is a complete absence of high scaurs of drift, such as characterise districts where there are recent rocky glens and old drift-filled ones. Boreland Glen on the Doon is excavated in rock of calciferous age, the river having left the old valley. Some distance above the head of the glen, opposite Shankston Loch, there is a 70-foot drift-scaur on the left bank. The old glen or valley may be on this side, but on this point I cannot speak with certainty.

Garepool Burn.—At about 1000 feet of altitude the Garepool, New Cumnock parish, turns suddenly to the left, leaves the old valley, and has cut a new channel through rock, with almost perpendicular walls, at first to a depth of about 40 feet. In this rocky gorge it descends for about 400 feet (vertical) till it comes to the plain of the Nith. This burn has perhaps the greatest declivity of any Ayrshire stream, falling 1000 feet in a distance of 12 furlongs. The drift-filled valley is to the south of the new rocky cut.

River Girvan.—The Girvan about the neighbourhood of the Straiton to Newton-Stewart road bridge, in the lower reaches of the Blairquhan Policies, and further down, has made a few rock-cuttings, but they are of no great magnitude, and some of them may be in the bottom of the old glen.

Penwhapple Burn.—The Penwhapple below the furthest up bridge over it, cuts deeply into the fossiliferous Silurians, the old glen being probably to the south of the rocky cutting.

River Stinchar.—The Stinchar above Black Row cuts a rock-glen in the greywackes, and, as the drift immediately below this glen on its (the Stinchar's) left side is about 100 feet thick, the old glen may be on that side.

Dunnach Burn.—The Dunnach (a tributary of the Tig) does not leave the old valley very much, but for a considerable distance on its left it has bared the old, glaciated, steep rock-bank of deposits, the right bank showing great high scaurs of drift (*See Figure 5*).



Fig. 5, Diunnach Burn.

App Water.—The App, owing to its running between high steep-sided hills, has not left the old valley in scooping out the drift-beds, except towards the very head of the glen, where the burn turns suddenly, leaving the boulder-clay, and runs on rock, the old valley of the App at this part being still filled with drift, covered by peat.

A number of the streams, as the Afton, Craig's Burn, Polgown, Pundeavon, Pitcon, Routenburn, Powgreen, Potian, Burn Anne, and others, cut through rock probably in the bottoms of the old glens, or sideways from them; though some of them may have old glens placed at some distance from the new ones.

Hollows at the bases of the hills.—A number of the Ayrshire rivers have considerable hollows at the bases of the hills, as for instance the Powgreen at the base of Cuff Hill, the Garnock above the falls, the Afton at Montraw, the Gass Water at the base of Wardlaw, the Nith near Waterhead, the Girvan at Loch Bradan, the Bottom at the base of Blackcraig, the Tig below Strawarren Fell, the Clocklowie at the base of Clocklowie Hill, the Haw near Laggish (the hollow), the Deugh above Glenenlee, and others; and at the north and north-east bases of Corsincone there are deep hollows—the culminating feature in this respect being the hollow in which Loch Doon is situated.

These hollows have certainly never been formed by the rivers, and have possibly been made by the joint action of the streams, the first glacier-ice and the sea, and subsequently received their present forms by glacier-ice, as we clearly see by the manner in which Loch Doon's rocky shores are *moutonnée* and striated. Some of them, as Loch Doon, may be due to subsidence.

Positions of the post-glacial glens.—The positions of the rocky post-glacial glens, in a marked degree, depend on the formations

over which the streams run. The rule appears to be, that the older the formations are, the fewer are the post-glacial glens cut in them, apparently for the reason that the older the formation the deeper the pre-glacial glen would be, so that when the land rose after the glacial depression the streams would be the more easily guided back into their old hollows in the deeper-sided glens than in the shallower-sided ones of the newer formations.

Mouths of the Rivers.—That the land stood higher before the glacial period than it does now is clearly shown by the western Scottish Lochs which are just drowned valleys, as has been often remarked by geologists; the land, after the great depression during glacial times—like a spring which has been bent beyond the limits of its elasticity—not having recovered its former level. The mouths of some of the Ayrshire valleys are still beneath the level of the sea, such as the Noddle, Gogo, Garnock, Irvine, Girvan, Stinchar and App.

The Ayr and the Doon flow on rock within the limit of the tide, and this makes me think that at these parts they have left the lines of their old valleys; but, without boring, it would be mere conjecture to suggest where the filled-up glens may be.

Physiography of Ayrshire before the Glacial Period.—During the glacial period, it is perhaps not going beyond the mark to state that an average of 40 feet of material was removed from the surface of the country (there may have been much more), part of it having been re-deposited on that surface, and the rest carried off, mostly into the sea, in the shape of mud, etc. The drift-deposits if spread equally over the whole shire would certainly not reach to anything like 40 feet, perhaps to not more than 10 feet. What makes me take 40 feet as the average minimum that has been removed (or shifted) is the fact that in America, outside the glaciated area, the rocks, even granite and gneiss, have been rotted by percolating acidulated water to a depth of 60 feet (of course during the glacial period they had all that extra time to rot). Now in Ayrshire, under thick drift (say more than 10 feet), the rocks are always found to be solid, showing that, before the drift was deposited on them, all the rotten rock had been removed, and there is no reason to doubt that it was any thinner than 40 feet; even since the glacial period some unprotected rocks have been rotted to a depth of 20 feet, and

although some surface sandstones, etc., shew striations, they are generally found to be loose-jointed to some depth.

There is every reason to believe that the valleys were steeper-sided than they are now, apart from the post-glacial rocky ravines, for these ravines clearly teach us that rivers of water produce different features than those given by land-ice, and it is to the carving action of the latter that we owe the principal contours of our valley-slopes, apart from any drift which is on them. Then the soils would be entirely different; at present they are, generally speaking, just rotted boulder-clay and humus, except for a bit inland from the coast, and in the hollows of some of the valleys; at that time the rocks would determine the nature of the soils, and give a great variety, from the manner in which the different beds came to the surface..

The most striking feature of Ayrshire physiography at the present day—apart from the hills—is the drums of drift which give the surface such a rolling appearance. The hills now are remarkably rounded in outline; then they probably presented numerous peaks on the sky-line, and the corries would be deeper and more gulch-like. Whether or not the “necks” of the old volcanoes, so common in Ayrshire, presented prominent features in the shape of torrs (or perhaps remains of cones of ejection) it would be difficult to say. At present a few of them do so, as Loudoun Hill, Blacklaw, Sorn Hill, Castlehill and others (all plugged throats), but many of them have been shaved down to about a level with the surrounding strata.

There were probably no lochs, the old drainage system having apparently been too complete, from long ages of river denudation, to allow of pools of stagnant water. When we look at the great rocky glens which have been cut since the glacial period by some of the rivers, we may feel pretty well satisfied that the pre-glacial drainage-system was perfectly complete.

What the land fauna and flora were like we have not a vestige of evidence left to tell (at least available); the Reindeer and Mammoth remains, with their accompanying few fresh-water plant-seeds, cannot be taken as representatives, as they clearly belong to the beginning of the “wintry period.” The “shore-plants” found growing on the flanks of Merrick (alt. 2764 feet)—opposite the Ayrshire border—may be descendants of species which

flourished there, on a shore-line, during the glacial submergence ; and, if we are to judge from the large number of plants in icy regions at the present day, perhaps the bulk of the indigenous flora survived the glacial period. We can state this with all the greater confidence as a considerable list of drift species is already known, from the beds between the boulder-clays. There was probably no "inter-glacial" period properly speaking, the ice never having completely melted away during the glacial period.

Ayrshire would probably have no coast-line at that time, the land standing higher above sea-level than it does now, and a great valley extending away to Arran and Cantire, with the Clyde joined by the Ayrshire rivers and others, running through it. At present an elevation of the land would leave a large fresh-water loch between Ayrshire and Arran.

VIII.

THE FORMATION OF NEW LAND BY VARIOUS PLANTS.

BY G. F. SCOTT ELLIOT, M.A., B.Sc., F.L.S., F.R.G.S.

(*Paper read 2nd June, 1899.*)

THE few remarks which I have to offer to-night deal with one of those new departures in Biology which have, so far, not succeeded in obtaining a firm footing in British Botany; neither text-books, the laboratory worker, nor even the out-of-door botanist, as a rule, pay any attention to the fact that wherever ground with a definite, more or less uniform environment exists, there we find a certain set of plants adapted to live together under those special conditions. Each has its own part to play in the state in which providence has placed it. This is true of every single plant in a meadow or wood, and there is the same differentiation of function even in a marsh or open water. Each of these organisms, the wood, the meadow, and the loch, is a plant-association or vegetable community, and is as much a subject for biological inquiry as a single species is a subject of investigation.

But—and here I think that the current systems of Warming (*Lehrbuch der Oecologischen Pflanzengeographie*. Berlin, 1896) and others are unsatisfactory—at the boundary between the loch and the meadow or between the latter and the forest, there is a series of parallel belts of plants which lead by slow gradations from one well marked association to the other. These fringing plants, which are included by Warming as separate plant communities or associations, should, I think, be considered simply as neutral belts. It is impossible to show them on a map except with an absurdly small scale, and the introduction of so many separate associations leads, I think, to needless confusion and complication.

Similar transitional belts exist to every community of plants. Thus, for example, there is a fringe of special species between the bare earth of a road and the grass by the footpath. At the edge of every railway track, on every ballast-heap, on every bare exposed rock, in the shingles and sandbeds of rivers, in fact wherever a dominant plant-association is interrupted by any cause, there we find a distinct and definite series of fringing species.

Plants which assist to form culture-land are extremely numerous. In this country, besides the water species, there are fringes to the sand-dunes on which *Psamma* is at first the only species, as well as fringes to rocks and walls, to ballast-heaps, etc. Warming gives a large number of other cases, such as those found on lava plains, rock-slips, rock-falls, burnt wood, or burnt meadows, abandoned cultivation, etc. The subject covers far too wide a ground therefore for one paper, and I have restricted myself entirely to the land-acquiring plants of fresh or brackish water.

A very good example of a land-forming plant is *Scirpus lacustris* var. *Tabernæmontani*, which occupies a considerable number of the bays about Langbank wherever a suitable muddy floor is present. The plant has horizontal skirmishing runners which fix themselves by long roots about 9 inches apart. This, or a little less, may be taken as the annual advance towards the water. Once established, about 40 to 50 vertical dead stems may be counted in an area of a square foot. Dead leaves and floating rubbish of all kinds, old rags, corks, floating stems of the plant itself, catch amongst these vertical leaves. It is, in fact, a sort of honeycomb of dead *Scirpus* leaves, vertical stems and leaf bases forming a kind of stake-and-bind arrangement, and silt will accumulate in it until the level rises year by year above ordinary tides. This process is much assisted by the growth and decay of *Ectocarpus crinitus*, *Vaucheriae*, Diatoms, and other attached algæ; the whole forms a tangled mass of decaying organic matter, and gradually raises the soil.

Examining the landward side of such a bed, the first plants to make their appearance are *Cochlearia officinalis*, *Aster Tripolium*, *Armeria*, *Juncus acutiflorus* and *Agrostis alba*. Then a few *Iris* rhizomes, afterwards *Juncus communis*, and finally the meadow grasses appear; the last are regularly grazed by cattle. Of these, all have peculiarly sturdy stems and considerable staying power

against the scour of the tide. *Cochlearia* has a remarkably neat way of protecting its young leaves. The young leaf is doubled and placed round the stalk of the next oldest. At the tip of the leaf is a little white scar which entirely protects the leaf below.

On the opposite side of the Clyde above Dumbarton Rock, *Scirpus maritimus* acts in a very similar way. The annual advance, probably 4 inches, is, however, not so great. There is, in this case, a peculiar little tuber formed at the end of each rhizome. It is carefully protected, first by the bases of the old leaves which wither on it, and secondly, by the pericycle becoming a hard sclerenchymatous shell. Thus it is very well suited to resist small animals, and even when uprooted and washed to and fro in the tide, it does not break off.

Scirpus (Blysmus) rufus, which is to be found on the Langbank side, has the simple typical growth of a sympodial rhizome, yearly pressing some 2 or 3 inches seawards. It is therefore a land-former, though by no means of the same importance as *Scirpus lacustris*.

The entire genera of *Scirpus* and *Carex* have a general tendency to this creeping rhizome habit. In the water-forms and *Carex arenaria* the rhizome is very long, and in those of dry land it tends to shorten so as to form a tuft or bunch of stems. I think that in the water species the untidy remains of dead stems are really of great importance to the plant. The leaves being strictly sheathing and more or less triangular in shape admit of an air-passage between them, and down this, no doubt, travels the oxygen required by the mud-buried rhizomes. In most also the dead leaves, or their bases at least, are never thrown off, but remain as a sheath which is burst through by the developing roots and rhizomes. It is probable that most of the valuable organic matter of the leaf is thus never lost, but passes into the rhizomes.

Amongst fresh water land-formers of a similar type *Phragmites communis* is very conspicuous—for example at Possil Marsh. Its rhizomes are at times 16 feet in length, and from them are given off sideways much shorter branches; the arrangement in some cases being almost like the ribs and keel of a ship, though apt to be irregular. This plant covers many square miles in the Danube region, as well as in the Caspian, and in Australia. It is said to reach a height of 18 feet, and can grow in 9 feet of water.

Other plants with similar rhizomes grow outwards from the firm land of the shore above the main shoots of *Phragmites*. *Comarum palustre*, *Menyanthes trifoliata*, *Scirpus lacustris*, and *Hippuris* are good examples. The water is thus divided by a network of horizontal runners and erect stems and leaf-stalks, and in this entanglement, mud, algæ, dead leaves, etc., rapidly increase.

On the surface amongst these stems, Plankton-forms such as the Lemnas, *Anabaina flosaquae* (Hogganfield Loch), and other algæ and diatoms increase to an enormous extent, chiefly because they are wind-sheltered. Shallow water is thus rapidly encroached upon, and small ponds may become choked up in a few years. If, however, the bottom is steep, the land-formation is much more slow. No doubt, the perpetual falling off of mud will gradually raise the level, but the march is imperceptible.

Another important land-former is *Glyceria fluitans* var. β . This grass is very active on the Forth and Clyde Canal on the upper side of the locks where a sort of bay is formed as the Canal narrows to the lock entrance. It sends out floating rhizomes sometimes 5 feet long or more. Besides diatoms and floating debris many Spirogyras, Zygnemas, etc., grow epiphytically upon it. As the land accumulates (one can distinctly trace in places 3 feet of land acquired by it) *Poa annua* and many mud-plants press in amongst its big swollen rhizomes and soon kill these out and occupy their place. All these plants, *Scirpus lacustris*, *S. maritimus*, *S. rufus*, *Phragmites*, *Glyceria fluitans*, as well as *Hippuris* and *Menyanthes*, agree in certain points. They have long internodes, a very loose spongy structure, and the rhizome is horizontal. The long internodes are a special case of the law that plant-parts in water tend to elongate. The sponginess has never been properly explained. (My own view is that the epidermis is so weak, and the whole plant so much without hard substance, that there is nothing to check a widening of the tissue). As to the horizontal habit of the rhizomes, it is partly dependent on light, for the ends certainly turn up whenever they can manage to do so.

These examples are sufficient to show how prevalent land-formers are in this country. In the British Flora I count 26 genera which are land-formers of this type. *Hippuris*, *Glyceria*, *Phragmites*, *Digraphis* (riversides) and all the genera of *Cyperaceae* have representatives of this kind; others are *Juncus*, *Butomus*,

Alisma, *Acorus*, *Sparganium*, *Typha*, *Polygonum amphibium*, *Comarum palustre*, *Nasturtium officinale*, *Ranunculus Lingua* and *R. Flammula*, *Equisetum limosum* and *Isoëtes*.

Other water-plants are of importance in this respect, chiefly, because by their decay they fill up shallow ponds or edges of rivers. They may be classed as *Plankton or free floating forms*, of which *Lemna*, *Hydrocharis*, *Riccia*, *Volvox* and the Diatoms are the most important. Diatoms appear to develop best in muddy water, and have apparently two crops per annum, one in spring and the other in autumn. Great masses of *Lemna* may be seen in Possil Marsh, forming a regular beach of decaying organic matter. Another group in which the leaves alone float is poorly developed in this country. *Nymphaea*, *Nuphar*, *Limnanthemum*, and *Potamogeton natans* are almost the only representatives. As land-formers they cannot be given a high place.

Floating submerged plants, on the other hand, are fairly numerous. There is an extraordinary similarity in the leaves of *Ranunculus aquatilis*, *Myriophyllum*, *Apium*, and *Ceratophyllum*; some Potamogetons and *Scirpus fluitans* tend to the same type. *Hottonia* and *Utricularia* also show it in a less regular condition. This fine division is undoubtedly brought about by the water-life, and the result is to make a sort of tangle of leaves very like what one sees in a grass meadow.

Callitriche and *Elodea* are of a different structure. The first is intermediate between the floating-leaved and the submerged type. The second is transitional between the submerged-floating and submerged and attached type. This last consists of certain rare plants which are fixed on the floor and give a sort of submerged aquatic meadow. *Lobelia Dortmanna*, *Littorella*, *Limosella*, *Zostera*, *Naias*, *Zannichellia*, *Ruppia*, *Isoëtes*, *Fontinalis*, *Chara*, and many algæ come in here. They simply fix (and assist in adding to) the soil.

I have mentioned the leading forms of these aquatic plants to bring out a curious point. There are nearly three times as many genera of Dicotyledons as compared with Monocotyledon genera in the Flora, and yet more than half of these aquatic genera are Monocotyledons, showing, as comes out also from geological data, that the Dicotyledons are, on the whole, driving out the lowlier forms, and forcing them to return (like whales) to a water life.

These scattered observations are, I think, sufficient to show that there is even in Britain a great deal to discover in the habits of common wild plants. They have also a very important practical bearing, as the filling up of ponds and ditches and the "winning" of new grazing land must be always well worth the attention of the agriculturalist.

IX.

CLYDESDALE FUNGI.

BY R. B. JOHNSTONE.

THE Council of the Society, when drawing up the list of excursions for 1899, decided to make "fungi forays" a distinctive feature in the year's programme, and arranged to have four excursions in the autumn for the special purpose of searching for fungi and compiling complete lists of all the species identified. Judging from the numbers that attended these excursions, there is no doubt but that this new feature was appreciated by the members, and it is hoped that after such encouragement the work will be prosecuted with even greater zeal in the future.

Unfortunately, the fungus period is very limited, generally lasting from the middle of September till the frost appears; and, as the growth is greatly dependent on certain climatic conditions, the number of species in a district vary greatly each year, according as the conditions are favourable or otherwise. This year (1899) has not been a favourable one, owing to the weather being too dry at the commencement of the season, and wet and cold at the close, and the result is that several species have not appeared.

The first excursion was to Craigton Wood, Milngavie, on 30th September. This wood is generally prolific of fungi, but, on this visit, owing to adverse weather circumstances, it had a barren appearance. The result of the afternoon's search was that thirty-six species were identified, the best being *Ag. (Flammula) alnicola*, *Lactarius mitissimus*, *Cortinarius sanguineus*, and *Nyctalis parasitica*.

The scene of the second excursion was Cadzow Forest, on 7th October. Whilst other objects of interest in these woods received their fair share of attention, special search was made for fungi, which were remarkably scarce. Terrestrial species were almost entirely absent, most of those collected being obtained from trees

or old stumps. Altogether twenty-eight species were identified. Foremost amongst them was *Fistulina hepatica*, the beefsteak fungus, an edible species, which grows on old oaks. Others of importance were *Polyporus sulfureus* and *P. intybaceus*, the latter being edible when young.

The third excursion took place on 14th October to Cadder Wilderness, a favourite hunting ground for fungologists. Here also, the fungi were far less numerous than usual, yet fifty-seven species were identified, and these included *Ag. (Aman.) phalloides*, *Ag. (Colly.) platyphyllus*, *Ag. (Heb.) glutinosus* and *Bulgaria inquinans*.

The fourth and last "foray" was at Cathkin Braes, on 21st October. As in other places visited this season, the fungi were scarce, still forty species were identified, among them being *Ag. (Lepiota) carcharias*, *Cantharellus aurantiacus*, *Stemonitis fusca*, and *Physarum nutans*.

The result of the four excursions is that one hundred species and one variety have been identified. To ensure accuracy all doubtful ones were confirmed by Mr. William Stewart, Glasgow, Rev. D. Paul, LL.D., Edinburgh, or Dr. C. B. Plowright, King's Lynn, Norfolk.

In the appended table the first four columns indicate the result of this year's work; and the additional columns shew the species collected at previous "forays" made by the Society in the following places:—

CADDER WILDERNESS, 13th October, 1888. List compiled by the late Prof. T. King.

CRAIGTON WOOD, 12th October, 1889. List compiled by the late Mr. R. Turner.

LOUDOUN CASTLE, 2nd October, 1890. List compiled by the late Prof. T. King.

DOUGLAS SUPPORT, ROSEHALL, 11th October, 1890. List compiled by the late Prof. T. King.

FINLAYSTONE, LANGBANK, 14th October, 1893. List compiled by the late Prof. T. King.

BLAIR POLICIES, DALRY, 5th October, 1895. List compiled by the late Prof. T. King.

HAMILTON LOW PARKS, 3rd October, 1896. List compiled by Mr. William Stewart.

The × denotes that the species was found at the place indicated at the top of the column, and the – in the first and third columns denotes additional species found in Craigton Wood in 1889, and Cadder Wilderness in 1888. In all one hundred and sixty-nine species and one variety are recorded.

For the Hymenomycetes the nomenclature in Stevenson's *British Fungi* has been followed, and for the remaining orders that in Cooke's *Handbook of British Fungi*.

		1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
		Craigton.	Cadzow.	Cadder.	Cathkin.					
Agaricini.										
AMANITA.										
AGARICUS RUBESCENS, Pers.	...	x		x			x		x	
AG. VAGINATUS, Bull.	...	x		x	x					
AG. MUSCARIUS, Linn.	...	x		x				x		
AG. PHALLOIDES, Fr.	...			x						
AG. SPISSUS, Fr.	...	—								
LEPIOTA.										
AG. GRANULOSUS, Bat.	...	—			x	x			x	
AG. CARCHARIAS, Pers.	...			—	x					
ARMILLARIA.										
AG. MELLEUS, Fl. Dan.	...	x	x	x		x	x	x	x	
TRICHOLOMA.										
AG. SAPONACEUS, Fr.	...	—								
AG. VIRGATUS, Fr.	...	x		x		x			x	
AG. TERREUS, Sch.	...			x						
AG. SORDIDUS, Fr.	...			x						
AG. RUTILANS, Sch.	...		x							
AG. NUDUS, Bull.	...				x					
AG. IMBRICATUS, Fr.	...						x			
CLITOCYBE.										
AG. ODORUS, Bull.	...			—						
AG. GEOTROPUS, Bull.	...								x	
AG. FRAGRANS, Sow.	...							x		
AG. LACCATUS, Scop.	...		x	x		x	x	x	x	
var. AMETHYSTINUS, Sow.	...	x	x			x	x			
AG. DEALBATUS, Sow.	...	x	x							
COLLYBIA.										
AG. BUTYRACEUS, Bull.	...	—	x	x				x	x	
AG. CONFLUENS, Pers.	...							x		
AG. RADICATUS, Rehl.	...	—				x	x			x

	1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
	Craigton.	Cadzow.	Cadder.	Cathkin.					
AG. DRYOPHILUS, Bull. ...	x				x				
AG. VELUTIPES, Curt. ...						x		x	
AG. PLATYPHYLLUS, Fr. ...			x						
MYCENA.									
AG. GALERICULATUS, Scop. ...	—	x	x		x	x	x		x
AG. POLYGRAMMUS, Bull. ...	x								x
AG. PURUS, Pers. ...								x	
AG. EPIPTERYGIUS, Scop. ...		x		x				x	
AG. RUGOSUS, Fr. ...							x		x
AG. SANGUINOLENTUS, A. and S.								x	
AG. GALOPUS, Pers. ...								x	x
OMPHALIA.									
AG. UMBELLIFERUS, Linn. ...				x	x				
PLEUROTUS.									
AG. CORTICATUS, Fr. ...							x		
AG. MITIS, Pers. ...								x	
PLUTEUS.									
AG. CERVINUS, Sch. ...	x		x					x	
ENTOLOMA.									
AG. JUBATUS, Fr. ...									x
AG. CLYPEATUS, Linn. ...								x	
CLITOPILUS.									
AG. PRUNULUS, Scop. ...	x		x				x		
NOLANEA.									
AG. PASCUUS, Pers. ...				x					
AG. PISCIDORUS, Ces. ...							x		
PHOLIOTA.									
AG. MUTABILIS, Sch. ...	x		x	x				x	
AG. SPECTABILIS, Fr. ...		x	x				x	x	
AG. SQUARROSUS, Müll. ...	x	x	x			x			x
AG. FLAMMANS, Fr. ...			—		x				
INOCYBE.									
AG. OBSCURUS, Pers. ...							x		
AG. RIMOSUS, Bull. ...	x		x				x	x	
AG. GEOPHYLLUS, Sow. ...						x		x	x
HEBELOMA.									
AG. GLUTINOSUS, Lind. ...			x						
FLAMMULA.									
AG. SAPINEUS, Fr. ...			x	x					x

			1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
			Craigton.	Cadzow.	Cadder.	Cathkin.					
AG. ALNICOLA, Fr.	...	...	x		x						
AG. SCAMBUS, Fr.	...	...	—						x		
GALERA.											
AG. HYPNORUM, Bat.	...	...		x	x	x	x		x	x	
CREPIDOTUS.											
AG. MOLLIS, Sch.	...	...	x						x	x	
PSALLIOTA.											
AG. CAMPESTRIS, Linn.	...	...	x		—				x		
STROPHARIA.											
AG. ÆRUGINOSUS, Curt.	...	...	x		x				x		
AG. SEMIGLOBATUS, Bat.	...	...		x		x					x
HYPHOLOMA.											
AG. APPENDICULATUS, Bull.	...	...									x
AG. EPIXANTHUS, Fr.	...	...								x	
AG. FASCICULARIS, Huds.	...	...	x	x	x	x	x	x		x	x
AG. SUBLATERITIUS, Sch.	...	...		x	x						x
AG. VELUTINUS, Pers.	...	...						x			x
AG. CAPNOIDES, Fr.	...	...							x	x	x
PSILOCYBE.											
AG. SEMILANCEATUS, Fr.	...	...		x		x		x	x	x	x
AG. SPADICEUS, Fr.	...	...									x
PANÆOLUS.											
AG. CAMPANULATUS, Linn.	...	...	—						
COPRINUS MICACEUS, Fr.	...	...	—		x			x		x	x
COP. PLICATILIS, Fr.	...	...						x			
COP. ATRAMENTARIUS, Fr.	...	...	x	x		x					
COP. COMATUS, Fr.	...	...		x							
MYXACIUM.											
CORTINARIUS ELATIOR, Fr.	...	...			x					x	
DERMOCYBE.											
CORT. CINNAMOMEUS, Fr.	...	...					x				
CORT. SANGUINEUS, Fr.	...	...	x								
PAXILLUS INVOLUTUS, Fr.	...	...	x		x						
HYGROPHORUS CHLOROPHANUS, Fr.						x	x	x		x	x
H. COCCINEUS, Fr.	...	...					x	x	x		
H. PRATENSIS, Fr.	...	...				x					x
H. PSITTACINUS, Fr.	...	...	x			x	x			x	x
H. PUNICEUS, Fr.	...	...					x				
H. VIRGINEUS, Fr.	...	...	x			x	x	x	x	x	x

		1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
		Craigton.	Cadzow.	Cadder.	Cathkin.					
LACTARIUS BLENNIUS, Fr. ...	...	x			x		x		x	
L. CAMPHORATUS, Fr. ...	...			x						
L. FULIGINOSUS, Fr. ...	...					x				
L. MITISSIMUS, Fr. ...	...	x							x	
L. QUIETUS, Fr. ...	...	x	x	x	x	x	x		x	
L. RUFUS, Fr. ...	...					x				
L. SERIFLUUS, Fr. ...	...				x					x
L. SUBDULCIS, Fr. ...	...	x	x					x		x
L. TURPIS, Fr. ...	...	—					x	x		
L. VELLEREUS, Fr. ...	...			x						
RUSSULA ADUSTA, Fr. ...	...		x							
R. NIGRICANS, Fr. ...	...	x	x			x	x			
R. VIRESCENS, Fr. ...	...					x				
R. CYANOXANTHA, Fr. ...	...	x	x	x	x	x	x			
R. FÆTENS, Fr. ...	...			x		x				
R. EMETICA, Fr. ...	...	x	x	x	x	x		x	x	x
R. OCHROLEUCA, Fr. ...	...	x	x	x	x			x	x	x
R. FELLEA, Fr. ...	...	—		x	x	x	x		x	x
R. DEPALLENS, Fr. ...	...				x					
R. RUBRA, Fr. ...	...				x					
R. HETEROPHYLLA, Fr. ...	...		x							
R. ALUTACEA, Fr. ...	...		x		x					
R. FRAGILIS, Fr. ...	...			x						
R. INTEGRÆ, Fr. ...	...		x							
CANTHARELLUS CIBARIUS, Fr. ...	...			—					
C. AURANTIACUS, Fr. ...	...				x					
C. TUBÆFORMIS, Fr. ...	...			x						
NYCTALIS PARASITICA, Fr. ...	...	x								
MARASMIUS PERONATUS, Fr. ...	...	—							x	x
M. ROTULA, Fr. ...	...						x			
Polyporei.										
BOLETUS EDULIS, Bull. ...	...	x		x	x			x		
B. LURIDUS, Sch. ...	...	x		x						
B. SUBTOMENTOSUS, Linn. ...	...	x		x			x			
B. BADIUS, Fr. ...	...			x						
B. CHRYSENTERON, Fr. ...	...			x	x	x	x			
B. FLAVUS, With. ...	...	x								
FISTULINA HEPATICA, Fr. ...	...		x							
POLYPORUS PICIPES, Fr. ...	...					x				

	1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
	Craigton.	Cadzow.	Cadder.	Cathkin.					
P. ADUSTUS, Fr. ...									
P. ABIETINUS, Fr. ...			—						
P. ANNOSUS, Fr. ...				x			x		
P. BETULINUS, Fr. ...			x						
P. GIGANTEUS, Fr. ...		x	x					x	x
P. IGNIARIUS, Fr. ...						x			
P. INTYBACEUS, Fr. ...		x					x		
P. SULFUREUS, Fr. ...		x							
P. VERSICOLOR, Fr. ...	—		x			x	x	x	
P. VAPORARIUS, Fr. ...			—						
P. RADIATUS, Fr. ...							x		
P. SQUAMOSUS, Fr. ...						x			
P. FUMOSUS, Fr. ...						x			
Hydnei.									
HYDNUM REPANDUM, Linn. ...					x			x	
H. RUFESCENS, Pers. ...							x		
ODONTIA FIMBRIATA, Pers. ...							x		
Thelephorei.									
STEREUM HIRSUTUM, Fr. ...			x			x	x		x
S. SANGUINOLENTUM, Fr. ...			x	x			x		
S. RUGOSUM, Fr. ...			x				x	x	
S. PURPUREUM, Pers. ...						x			
CORTICIUM LIVIDUM, Pers. ...							x		
Clavariei.									
CLAVARIA RUGOSA, Bull. ...					x		x	x	
C. FUSIFORMIS, Sow. ...		x			x				
C. CRISTATA, Pers. ...								x	
C. FASTIGIATA, Linn. ...			x						
CALOCERA VISCOSA, Fr. ...	—		x	x	x		x		x
C. CORNEA, Fr. ...								x	
TYPHULA ERYTHROPUS, Fr. ...							x		
PISTILLARIA PUBERULA, Berk. ...							x		
Tremellinei.									
TREMELLA LUTESCENS, Pers. ...									x
T. MESENERICA, Retz. ...							x		
T. ALBIDA, Huds. ...							x		
T. INTUMESCENS, Eng. Bot. ...		x							
Phalloidei.									
PHALLUS IMPUDICUS, Linn. ...	—	—					x		

		1899.				Loudoun Castle.	Douglas Support.	Finlaystone.	Blair.	Hamilton Parks.
		Craigton.	Cadzow.	Cadder.	Cathkin.					
Trichogastres.										
LYCOPERDON GEMMATUM, Fr.	...				×	×				×
L. PYRIFORME, Sch.	...									
SCLERODERMA VULGARE, Fr.	...	—		×				×		×
Myxogastres.										
STEMONITIS FUSCA, Roth.	...				×					
PHYSARUM NUTANS, Pers.	...			×						
Elvellacei.										
BULGARIA INQUINANS, Fr.	...			×						
B. SARCOIDES, Fr.	...			×						
HELVELLA CRISPA, Fr.	...							×	×	
LEOTIA LUBRICA, Pers.	...								×	
PEZIZA GRANULATA, Bull.	...							×	×	
P. MACROPUS, Pers.	...								×	
P. AURANTIA, Fr.	...			×						
P. SCUTELLATA, Linn.	...				×					
Sphæriacei.										
XYLARIA HYPOXYLON, Grev.	...	—	—			×	×	×	×	×

During the present Session (1899) two curious and interesting species have been exhibited at Meetings of the Society, viz.:—

Hirneola auricula-Judæ, Berk. (The Jew's Ear Fungus), found by Mr. John Robertson in Scalpsie Bay, Bute, and *Hormiscium pithyophyllum*, Sacc., a fungus which has not been previously recorded for this district. It was found by our President, Mr. John Paterson, on a yew tree in the Clachan avenue at Rosneath. Its identity was determined by Dr. Plowright.

X.

THE INJURIOUS EFFECTS OF SMOKE ON TREES.

BY JOHN BOYD.

(Paper read 2nd February, 1900.)

It requires no argument to persuade the most casual observer that serious injury is done to trees in localities where there is much smoke ; and not only to trees, but to all vegetation. The injurious effects are most apparent on long-lived plants. On annuals and herbaceous plants the pernicious results are not so noticeable, although, even here, the influence of an impure atmosphere is often only too evident. Even at this season, when the vegetable world is, so to speak, at rest, I am sure the members of this Society, who are taking frequent excursions into the country, cannot fail to observe the different appearance of the grass-fields, trees and plantations in this vicinity, compared with that which obtains thirty or forty miles out, where there is a clear, pure atmosphere, and all nature, although brown and bare, has something bright and refreshing to the eye that is wanting within what may be called the smoke area. This difference is even more marked after a spell of close foggy weather, when everything becomes quite polluted, and blackish-brown in colour. A very good illustration of the blackening properties of the atmosphere around Glasgow may be seen in the animal world in the case of sheep. It is quite a common practice, just after harvest, for flocks of sheep or lambs to be brought down from the Highlands and located in the district surrounding the city, where in a few weeks these beautiful, almost white, fleecy animals, become black and disreputable in appearance. As a proof of the filthy state pasture assumes in the winter months, it is frequently seen that if a field is left rough,

and sheep or cattle put on it after the growth has stopped, they will almost starve rather than eat it. Even rabbits will scarcely attempt it after the season has well advanced. They prefer gnawing the bark of trees or shrubs, the outside of which is perhaps no cleaner than the grass, but they nibble that off and get into the fresh under-bark. Experience proves that the ravages of ground game on trees are much worse in smoky localities than in others; the reason being, as already stated, that they will scarcely touch the old grass after the month of November. That is, however, an indirect result, and one which can very easily be removed if the parties concerned are willing.

The direct results of injury from smoke constitute a more serious problem, with which it is difficult to grapple. It is even questionable if it can be absolutely remedied. The damage directly done by smoke and its allies is of a threefold nature. *First*, there is the killing of the living matter in the green parts of plants, particularly in the leaves, caused by acid in the smoke; *second*, the clogging-up of the stomata of certain plants by soot, and the general coating-over with the same of all their parts; and, *third*, the effect of the smoky atmosphere in obscuring the sun. It is difficult, or even quite impossible, to define exactly the amount of damage done by each cause, because their action is always combined. Yet it may be as well to consider separately as far as practicable how the plants are affected by each of the causes detailed above, afterwards looking at the effect of their combined action.

EFFECTS OF ACID.—The gaseous acid in the smoke enters into the leaves during the process of carbon assimilation, at once attacking the living matter in the cells, and destroying it by oxidising or bleaching it, therefore rendering the affected portion absolutely useless. A leaf affected by acid, if held up to a strong light, shows little clear spots wherever the action has begun. Through time, these spots usually become brown, almost black in some plants, and they might readily be taken for an attack by a fungus. On a closer examination, however, a clear margin is seen round the coloured part, which distinguishes it from any disease. This form of injury is generally attributed to sulphurous-acid gas, which is always given off in the burning of coal and particularly dross, in varying quantities, according to the quality of the article being

consumed, and there is little reason to doubt but that it is the chief factor in the mischief, although there are other gases given off in limited quantities from various works which assist in the injury to vegetation. The effects of acid may be seen more or less in almost all species of broad-leaved trees growing in any smoky district, and is very easily recognised in its early stages on trees with coloured leaves. The various trees, however, are not all affected to the same extent, neither is any one species affected alike during all the growing season. It seems to be worst when the leaves are at their most active stage, very young leaves not being so readily injured as those that are fully developed, and are, so to say, in full swing at the process of carbon assimilation. Neither are leaves so readily affected when the season has well advanced and their working power has begun to wane. On Pollok Estate, this form of mischief is particularly noticeable in the early part of the season, no doubt because, at that time, east and north-east winds are more prevalent, and drive the smoke of the city over the place. On several occasions in recent years this was very noticeable. It so happened that, when the earlier trees had just got into full leaf, we had a continued spell of east wind, with the result that the foliage was very seriously injured. The leaves in many cases no doubt suffered from other causes, which was shown by the edges becoming brown, but there were also decided symptoms of the effects of acid in the manner already mentioned, with very serious results as regards the health and appearance of Horse-Chestnuts. Their growth was entirely stopped until after mid-summer, when nature, trying to recoup herself, sprang away with a young growth, rather a rare occurrence with these trees, which gave them a somewhat remarkable and not altogether pleasing appearance. Among forest trees, Oaks (particularly the Moss-cupped or Turkey Oak) seem to withstand or resist the attack of acid better than any others. Ash may be said to come next, followed by Elm and Sycamore. The Ash, however, has a decided advantage over the others, in that it is generally the last to put forth its leaves, and casts them early, thus having them exposed for a shorter time. Service trees, Birch and Rowans, especially the two former, are also well suited for growth in smoky localities, and are not so partial to a good soil as the others mentioned.

What has been said is chiefly applicable to broad-leaved, and especially deciduous trees. The same form of injury is, however, not wanting among conifers, although possibly on the narrow leaves it is not so apparent at first sight. On careful examination, however, the leaves are frequently found spotted in the same manner, and at times the spots go right round the needles, and cause the outer portion to die off, giving the injury the appearance of that caused by frost. The result in both cases is the same, the green living matter being killed, the power of the plant for carbon assimilation is reduced, and causes the leaves to fall prematurely. The balance of nature is interfered with, and the health of the trees in this way seriously impaired, making them more susceptible to attack from other causes, either by insects or fungi, especially the latter. Attacks by insects on conifers are fortunately less frequent on the trees which are most affected by smoke than one would expect. Indeed those insects which breed on sickly pines are conspicuous by their absence in this locality. Although they are occasionally found, there has not been noted anything like what might be termed a general attack, which would lead one to the conclusion that they have an aversion either to the dirty trees or the impure atmosphere. This is especially the case with the Pine Bark Beetle (*Hylurgus piniperda*), which very often proves to be a serious pest in pine woods, where the trees are in such a state of health as obtains in the surrounding district.

EFFECTS OF SOOT.—The next point of importance is the sooty part of smoke and its effects. It is argued by some that this factor is not at all injurious to broad-leaved plants, and especially deciduous species, and I do not doubt but that, with such plants, it is of minor importance compared with the effects of acid gases, but I am inclined to believe that it does considerable harm, particularly to Evergreens; an instance of this was brought under my notice last summer in Messrs. Smith and Simons' Nurseries at Kennishead. There were several days of very dense fog, towards the end of January, 1899, which blackened everything to a remarkable degree, the leaves of Evergreens being simply painted with soot, and, for the want of a good day's rain immediately following, it got fixed on and adhered to some extent for a considerable time, the result being well demonstrated in the instance referred to, where a few plants in a plot of Aucubas were, by a mere chance,

syringed and freed from this coating, with the result that they looked healthier all year and made a better growth than the average of the remainder of the plot. This seemed to show that the soot on the leaves has to some extent a prejudicial effect on the plant, not in the way of injuring them, for those that were not cleaned were free from any particular injury by acid in the soot, but, in my opinion, by the coating in some way affecting the action of the chlorophyll, presumably by the sun's rays having less power, through having to penetrate this film or scum on them. This may also apply to deciduous plants, but in a less degree, because their leaves have a much shorter life, and have not the chance of becoming coated to the same extent, although that they do get blackened any one may prove by drawing a few leaves through a clean hand, or, better still, through a clean white handkerchief. It is admitted, however, that the injury done by smoke in this way, to such trees, is very little, compared to what happens with conifers, which, with a few exceptions that may be overlooked, are Evergreens. In the first place, the particles of soot in the air seem to adhere more to the leaves of the majority of such trees than is the case with the others. This may be accounted for, with some, by the resinous and sticky nature of the skin of the leaves, and with others, such as *Cupressus* etc., it is due to some extent to the position of the leaves, which forms a kind of trap for collecting it. Further, the formation of the stomata permits of such particles entering in, and more or less choking them, which means partial starvation and suffocation for the plant. Some leaves taken from Scots Firs on Pollok, and cut into sections, showed almost every pore to be more or less closed in this way. This is bound to impair the health of the plants in no small degree, through the leaves being unable to perform their functions properly, and it also causes premature leaf-shedding, which is, however, greatly assisted by the leaf-shedding fungus (*Hysterium pinastri*), a disease which, unless in seed-beds, is not characterised as of a serious nature, but, when the young pine trees are in an unhealthy state through the effects of smoke, they are attacked all over by it, with very serious results. From this cause, last year, over 10,000 Scots Fir plants between 12 and 20 years of age had to be cut down on Pollok Estate.

EFFECTS OF DARKENED ATMOSPHERE.—This brings us to the

third way in which the trees are affected, viz., through the smoke in the atmosphere. I do not know if this source of damage has been much noted, but it is none the less present, although possibly not noticeable at first sight, particularly with trees standing singly. In woods or small thickets of trees, however, its effects are at once apparent, and I believe are much more wide-spread than either of the previous evils. It neither affects the health of trees standing singly, nor those in open woods, so much as it does those in close woods. The treatment of woods within a radius of six or seven miles of the centre of the city, or in any locality where there is much smoke, is entirely different from the ordinary routine. Woods, notably pine woods, must be kept much opener, to admit of the plants getting sufficient light to keep them in anything approaching a healthy condition, and I am of opinion that the continuous darkening of the atmosphere by smoke must take a great share of the blame for this. However, as previously stated, it is quite impossible to draw lines of distinction between the amount of injury done by each of the various causes, and having now considered how the trees are affected by them separately, a brief consideration of the total injury done in regard to appearance, health and growth, must suffice.

SUMMARY.—In appearance the natural beauty of the trees is marred. The freshness of Spring disappears sooner, through the blackening effect of the smoke, which is a great loss and disadvantage to many who are prevented from seeing nature unless in the public parks and woods in the immediate neighbourhood of the city, and throughout the whole year there is a lack of brightness, but of all the seasons, it is in Autumn that the greatest contrast is seen. Where are all the varying tints and shades of colour of the fading leaves of the woodlands in our glens and vales away out in the country? There is no comparison between trees in such places and those in the parks and suburbs of our city. No doubt there is a certain degree of this natural beauty left, but it is like a dim and imperfect copy of some fine picture. And what about the evergreen shrubs? At this season of the year, instead of being objects of beauty, they are frequently very depressing to the eye, being black, and in many cases tufted and open, rather than a dense mass of foliage, owing to the leaves falling off months or sometimes a year or more too early. Common Hollies are possibly the worst victims in

this class of plants, good specimens of which are scarcely to be found in this neighbourhood. I have already said that coniferous plants, and particularly Scots Firs, are the worst sufferers of all. But, before adding a little about their appearance, I would remark that, at no very remote time, the residents in this city who like to see a good Scots Fir tree will have to travel some distance to gratify their desire. Those near at hand, old and young alike, are without exception more or less seriously affected, their state of health being far from satisfactory. Their leaves fall off a year or more too soon, it being quite common to see them, at the beginning of the growing season, with nothing but the previous year's leaves adorning them, instead of two years complete and the greater portion of a third, thus detracting very much from their appearance, giving them a thin, tufted, stunted and unhealthy look.

On approaching the city from any side, particularly from the east or north-east, the general effect of smoke is in evidence, I think I may say, on all trees, some certainly being affected more than others, and any one of an observant nature, who travels to and from the city for a number of years, cannot fail to recognise the fact that the effect of smoke is of a cumulative nature as regards the health of the trees. If once a tree is noticed to be decidedly suffering from that cause it is doomed, its death being only a matter of time, it may be long or short, according to the species or variety and its suitability to the soil on which it is growing. The first sign is the early fall of the leaves, then the crown gets thinner, and the annual growth less, until it is practically at a standstill, and gradually the tree dies a premature death. Such symptoms are no doubt mainly due to the first-named cause, viz., the presence of acid in the atmosphere—the other causes lending their assistance, but certainly to a less degree. On going further afield, the injurious influences gradually become less discernible, and it takes a much longer time before there is any serious results, unless with very susceptible trees.

From what has been said, I am sure anyone will assume that the annual growth of trees is greatly reduced in smoky atmospheres, particularly those in the immediate vicinity of the city, but it is also quite noticeable a considerable way out, where the traces of injury through acid are scarcely to be found. On Pollok Estate I have watched this deficiency in growth, with no little interest,

for the last seven or eight years, and I calculate that the different trees are affected to something like the following extent in the various woods and plantations—those nearer Glasgow being decidedly the worst. With Oaks, Ash, Sycamore, Beech, Elm, Hornbeam, Birch, Service trees, Rowans and Austrian Pine the diminution in growth will vary in the different species from 10 to 20 per cent. in the immediate neighbourhood, and further out it will not be more than something like 5 to 7 per cent. If, on the other hand, the worst sufferers, such as Scots Fir, Weymouth Pine and Spruce, are compared, it is found that in plantations at the extremities of the estate, the annual loss in growth is about 10 to 20 per cent., and in those near-hand it is as much as 25 to 40 per cent., and gradually getting worse. Now if to this is added an equal reduction per cent. of stems per acre, it is at once evident that it is absolutely impossible to cultivate trees successfully from a commercial point of view in any smoky locality. In fact the great concern of those who either own or manage woodlands under such conditions is not how to make them pay, but how best to treat them so that they may be kept in anything like a satisfactory state of health. I think no one will deny that the smoke question as applied to the vegetable kingdom is quite a serious problem, and any one who finds a remedy will create a name for himself, and confer a blessing on his fellow men.

XI.

SCOTTISH FORESTS & WOODLANDS IN EARLY HISTORIC TIMES.

BY HUGH BOYD WATT.

(Paper read 1st April, 1898.)

WHEN pre-historic times were merging into the historic in the country which we now know as Scotland, the greater physical features of the land must have been substantially the same as we see them at present. Mountain, hill and lowland, islands, mainland and coast-line, lochs and river-courses have remained fixed in their main outlines since the time referred to, less than 2000 years ago. Changes have occurred, and in relation to such a feature as the coast-line, changes of consequence, but the early map of Scotland by Ptolemy (150 A.D.) shows the outline of the country quite recognisable to us, although the map is altogether wanting in detail, and the curious mistake is made of turning the northern part towards the east, our Mull of Galloway appearing as the farthest north point in Scotland. But the superficial features of the land have undergone great changes, partly from natural causes and partly from the hands of man; and one of the most prominent of these has had to do with the forests and woodlands. Persistent statements are made as to the prevalence of woods and forests in this country when the Romans first entered it—with whose coming written history begins for us. One or two dates may fix the period. The Caledonian Britons are first mentioned by Lucan (65 A.D.), but Scotland must have been visited by Pytheas (who flourished about 330 B.C.) in the course of his adventurous voyages of discovery, as Strabo gives us the name 'Ορχας (Orkney) from him, and this is probably the earliest written Scottish place-

name. Then in 78 A.D. Agricola began his series of campaigns, and Tacitus, the historian, takes up the tale. The Roman fleet circumnavigated Scotland in 84 A.D.

To assist in forming some conception of the actual extent and state of old Scottish woodlands I propose marshalling some evidence contemporaneous written history (*i.e.* Roman) gives, and also referring to the accounts of more recent writers, and those further forms of evidence which I may briefly characterise as natural or topographical and traditional.

That the Romans have left us little in the way of descriptions of Scotland need cause no surprise. They were here as an army of conquest and occupation, military affairs were their business, and the references they make to such natural features as woodlands are incidental only, and of the most general nature. Strabo says, speaking of the ancient Britons—"forests are their cities; for having enclosed an ample space with felled trees, they make themselves huts therein" (B.4. C.52); but this has probably more direct reference to England. In Agricola's second campaign (79 A.D.) he "explored in person the estuaries and forests (*silvas*)" on the west coast, south of the Clyde, including the Solway. He found a "fierce and savage people running wild in the woods" there. In the campaign of 83 A.D., when he had penetrated beyond Bodotria, *i.e.* north of the Firth of Forth, Tacitus, his historian, speaks of "deep woods and mountain passes." In addressing their respective armies before the great battle at Mons Graupius (a disputed locality, but where the Isla joins the Tay, according to Skene), Galgacus, the native leader, speaks of the Romans as forcing their captives to "clear woods and drain marshes," and Agricola reminds his men that in their marches they have "penetrated forests." The natives, being put to flight, "rallied in the woods;" and the "woods and marshes sheltered the fugitives" after another battle.

Scottish localities mentioned by Roman writers are not easy to identify, and at the most such passages as the above, which are from the *Agricola* of Tacitus, do not cover much ground. The description of the army of Agricola in order of march advancing northwards, cutting down woods, using trunks of trees to form roadways across morasses, building bridges of timber, and clearing brushwood and trees away from the neighbour-

hood of their forts or camps, while the natives looked down from their mountain retreats on their "ancestral trees falling before the axe of the stranger,"¹ receives a measure of support from the evidences yielded by some of our mosses, *e.g.*, in Lochar Moss (Dumfries), in Flanders Moss, and in the Mosses of Kippen and Kincardine (Menteith), where "portions of roadways composed of logs of wood laid closely together and bearing the marks of the axe have at various times been exposed to view," with an accumulation of 5 or 6 feet of peat-moss upon these timber-ways.² These are, doubtless, the "long bridges" of which Tacitus speaks.

Let me here say that I shall endeavour to state the case for the peat-mosses further on; in dealing with them there is a chronological difficulty, and it is my purpose to adhere to consecutive chronology as far as possible.

Referring to the "long bridges" it is also stated that the Emperor Severus, who pushed his conquests so far north as the shores of the Moray Firth (A.D. 207-8), laid down such structures across the bogs and morasses.³ He was continually harassed during his campaign by the natives who carried on a guerilla warfare against him, sheltering in the fastnesses of the woods and bogs; and of the 50,000 men whom he is said to have lost most of them perished in clearing these great woods (the remains of which still stand in Perthshire and Strathspey), and by the pestilences of an uncleared country.⁴ The principal trees of these forests were fir, birch and oak. Skene says—"What are now extensive plains, well-watered straths and rich carses must then have presented the appearance of a jungle or bush of oak, birch or hazel; the higher ground rocky and barren and the lower soft and marshy."⁵ It is difficult to gather anything like an exact picture of the state of the country at this period, as regards woods, from any evidence I can find; but I am convinced it is inaccurate to say that the whole surface of the country was densely covered with trees. The natives, who were evidently not sparse in numbers, fought in chariots, which could only have been of use in large

¹ Stuart's *Caledonia Romana*, pp. 99-101.

² *Ibid.*, p. 226.

³ *Herodian*, chap. iii.

⁴ Hunter's *Woods, Forests and Estates of Perthshire*, p. 8.

⁵ *Celtic Scotland*, I., p. 84.

open spaces, and they possessed horses and herds of cattle which required ample pasture-land. Such an opinion finds further support by the fact that the Romans called one particular portion of the country "Sylva Caledonia" (Pliny IV. 30) or "Caledonias Silva"—the Caledonian Forest—and to a sketch of the history of this I now proceed.

Here it may be necessary to point out that the word "forest" does not imply a wooded place, but that its meaning is more that of an extensive chase—hunting and sporting grounds lying in waste—where trees may occur, but they are not necessary to constitute the place a "forest." Such a meaning is illustrated in the present-day deer-forests of our Highlands, many of which are barren and waste wildernesses, without a piece of woodland contained in them. From the earliest time the meaning of this word has been misunderstood evidently; and Skene points out¹ that the Latin translator of Ptolemy's Greek expression "Caledonios drumos" converted the unknown word "drumos" into a word signifying an oak-wood—Caledonius Saltus or the Caledonian Wood. "Drumos" is a rendering of the Gaelic word "druim"—a ridge, and the expression (Caledonios drumos) is the equivalent of the historical name Drumalban, which was applied to the chain of hills forming the backbone of Scotland. Part of this name appears in the now current name of these mountains and of the district—Braedalbane. Professor Rhys, however, says (*Celtic Britain*, p. 224) that there is no occasion to suppose Ptolemy to have meant Drumalban by his expression "Caledonios drumos." Whatever may have been the exact meaning of the old names, I propose continuing to call the locality the Caledonian Forest, and to endeavour to point out that at first it had a definite geographical extent.

In Ptolemy's map one of the few topographical details is this great "Caledonias Silva," and, as there is no other "Silva" marked in the map, which includes the whole of the British Isles, it cannot be an error to believe that the locality was pre-eminently woodland to the eyes of the Romans, so far as their knowledge of the country at that time went. In the copy of this map, from the Latin Ptolemy of 1478, in Elton's *Origins of English History*

¹ *Celtic Scotland*, I., p. 76.

(2nd Ed., 1890) the wood is marked as stretching from Longus Fl. to Itis Fl. and inland from Creones on the west coast. Its southern limits seem to have been about the heads of Loch Long and Loch Lomond, thence it spread eastwards by the line of the Forth to Stirling, and extending northwards of this line, crossed Strathearn, and reached as far as Dunkeld. Birch and hazel are said to have been the predominating trees.¹ The people whom Agricola took hostages from, after his victory at Mons Graupius, bore the forest-like name Boresti,² the Brythonic equivalent of our word forest (dwellers in the forest), a suggestive piece of evidence. Early native writers have references to this Forest, but not in any way descriptive or topographical. Thus Nennius about the beginning of the 6th century records twelve battles fought under the native leader Arthur, the seventh was in the Caledonian Forest—"Coit Celidon" (in Brythonic); and the Welsh Triads (time of Rebellion of Owen Glendower who died 1415) contain "allusions to the Caledonian Forest." Later and modern writers have not been so reticent, and they have widened the district covered by this name to an extent and in a manner which may be called unhistorical, and so far as the mere name is concerned inaccurate. This is apparently in anxiety to prove the wooded nature of early Scotland, regarding which, however, this name is but poor evidence. The name Caledonia was probably a word like Britannia, made by the Romans,³ and was of limited application, and did not designate the whole of our Scotland. In Rhys's map (*Celtic Britain*) the tribe of the Caledonii (a Goidel-Ivernian people) is marked as extending from the head of Loch Long to Loch Ness. The native name was probably Calido, which word contains the root (Gaelic) *coille* = a wood, a further evidence that the Caledonii were *the* woodland people. Dunkeld, said to be at the northern end of the great wood, is in an old form, Duncalden or Duincaillen = fort of the wood. Caledonia has long been used to designate the whole of Scotland, and in a similar manner and with something of the poetic glamour that surrounds the name, the Caledonian Forest (of old) has broken its bounds, and rolled over the whole country.

¹ Skene's *Celtic Scotland*, I., p. 86.

² Rhys's *Celtic Britain*, p. 281.

³ *Ibid.*, p. 283.

At different dates, and in varying words, and of many localities, the same story is told—the name of the Caledonian Forest being taken more or less accurately or inaccurately. Thus Hector Boece, writing *circa* 1527, says: “The gret wod of Calidon . . . ran fra Striveling throw Menteith and Stratherne to Atholl and Lochquhabir; as Ptolome writtis, in his first table.” The Torwood was identified by the same old writer with the Caledonian Forest. John Major, writing in the 16th century, says: “Round the foot of the mountains are great woods. There, I incline to think, was the Caledonian Forest of which Ptolemy and the Roman writers make mention, and in these woodis is found an incredible number of stags and hinds.” Modern writers take up the tale:—“As for Scotland, . . . in the south a vast forest filled the intervening space between Chillingham and Hamilton, a distance, as the crow flies, of about 80 miles, including within it Ettrick and numerous other forests; and further north the great Caledonian wood, known even at Rome, covered the greater part of both the Lowlands and Highlands, its recesses affording shelter at one time to bears, wolves, wild boars and wild white cattle.”¹ Professor Veitch says:—“The extensive area covered by the old forests of the South of Scotland, which may be taken as including the vales of the Ettrick, the Yarrow, the Meggat, the Caddon and part of the Tweed, was but the remains of that great and ancient forest of Caledon—*Coit Celidon*—which stretched across the west of Scotland, including Cadzow, portions of Renfrew and Ayr, and the carses by and beyond the Forth, piercing northwards to the great plain bounded by the Highland mountains. In the border country, particularly in the secluded dales of Ettrick and Yarrow, there was abundant wood. It is possible even that the name of the original inhabitants of at least a portion of the Border district—Gadeni or Cadeni—meant dwellers in the wood.”² Mr. Jas. Barbour says:—“When the Romans entered Galloway about A.D. 80 they found the country covered with wood, except the exposed soilless summits of rocks and low marshy spots where wood would not grow. The trees were principally oak, ash, birch, alder and rowan . . . also an undergrowth of hazels and

¹ Harting's *Extinct British Animals*, p. 9.

² *History and Poetry of the Scottish Border*, p. 13.

7 thorns."¹ Here are a series of further definite statements. The Torwood is called a remnant of the ancient Caledonian Forest, and Fannyside Moor (Cumbernauld) was occupied to a comparatively recent period by a remnant of the ancient Caledonian Forest.² Dalrymple Wood (Ayrshire) is supposed to be part of the ancient Caledonian Forest; the Black Wood of Rannoch, a relic of the original forests of Scotland, is the only important remains of the great Caledonian Forest, and Gorthy (Perthshire) was originally part of the old Caledonian Forest.³ Invergarry deer-forest is one of the remaining patches of the original Caledonian Forest which formerly covered a large area in the north of Scotland.⁴ "Upper Strathspey would, in remote times, form about the centre of the great Caledonian Forest which is said to have extended from Glenlyon and Rannoch to Strathspey and Strathglass, and from Glencoe eastward to the Braes of Mar."⁵ Then we have the following picture:—"There can be no reasonable doubt, and present evidences prove, that the great old Caledonian Forest reached far beyond the Great Glen and Loch Ness into Ross-shire, Sutherland and West Inverness-shire, spreading its ramifications far over the passes, and even over the *cols* of the backbone of Scotland, down the western slopes towards the Atlantic, joined hands with the Black Wood of Rannoch, struggled across the dividing ranges of Dee and Forfarshire, and penetrated eastward beyond the Deveron into Buchan and north-east Aberdeenshire."⁶

Numerous general statements are made, such as that "the whole island was one vast forest,"⁷ but I have confined my extracts to those writers who definitely mention the name of the Caledonian Forest, and under their descriptive hands it has spread so as to extend from Galloway and Selkirk to Sutherland, and from Lochaber and west Inverness-shire to Buchan and Aberdeenshire. It is an instructive example of the growth and development

¹ *Trans. Dumfries and Galloway Nat. Hist. and Antiq. Socy.*, No. 12, p. 135.

² *Ordnance Gazetteer of Scotland.*

³ *Hunter's Woods, Forests and Estates of Perthshire.*

⁴ *Watkin Watkins's Trans. Caradoc and S. V. Field Club*, I., No. 4, p. 160.

⁵ *D. Nairne's Notes on Scottish Forestry*, p. 23.

⁶ *J. A. Harvie-Brown and T. E. Buckley's Vertebrate Fauna of Moray*, I., p. 130.

⁷ *Nairne's Notes*, p. 11.

of an historical fact, until the fact sinks into insignificance as compared with its accretions.

It is misleading to say that Cadzow Park "originally formed part of the great Caledonian Forest,"¹ for while the application of this name to it to-day may be sentimentally permissible, it is historically inaccurate, as it is certain that Cadzow was not included within the Roman "Sylva Caledonia." As an illustration of the curious statements made in support of the "great forest," the following is remarkable—"A ship of immense size having been constructed at Syracuse, by the celebrated Archimedes, two hundred years before the Christian era, a proper mainmast could nowhere be found for this ship but in the mountains of Britain."² This is incomprehensible, for the first invasion of Scotland was in A.D. 78 (England B.C. 55), apart altogether from the inherent improbability of the incident.

The "Sylva Caledonia" of the Romans was only a portion of the "one vast forest" of early times, of the wide-spread existence of which there is strong evidence from a natural source—I mean the peat-mosses and bogs of our country. These supply conclusive evidence of the presence of vegetation (and moisture), and frequently show that the vegetation included forest trees. The formation of these mosses, however, stretches through a long period of time. Though they have been called "the youngest of our geological formations,"³ so young that they may be seen in course of formation at the present day, yet they as certainly stretch back into pre-historic times, and consequently present some difficulty to one who is attempting a chronological history. Their period or date is sometimes approximately defined by witness which they themselves bear, *e.g.*, Kincardine and Flanders Mosses, which I have already mentioned as probably formed after the Roman occupation. Also when it is found that a forest of prostrate oaks, such as that cut through in 1823 when the canal from Carlisle to the Solway was being made, lies 3 or 4 feet below the level of the foundations of Hadrian's Wall, which passes

¹ Harting's *Extinct British Animals*, p. 229.

² Monteath's *Foresters' Guide* (Introduction) and quoted in *Vertebrate Fauna of Moray*, I., p. 125. (No authority given by either).

³ H. Miller's *My Schools and Schoolmasters*.

over these fallen trees,¹ there can be no doubt that they flourished and fell long before the coming of the Romans—are pre-historic.

We are carried still further back by the mosses and sunk forests of these now treeless regions—Shetland, Orkney, Caithness, Sutherland and the Hebrides, where many fallen and buried trees of good size have been brought to light where no natural wood of any consequence can now raise its head. According to Professor James Geikie the woodland days of these regions were so far back as that time when “to have permitted this strong forest growth we are compelled to admit a former elevation of the land and a corresponding retreat of the ocean.” That is, as I understand it, that since the neolithic age these districts have been all but treeless, as they are still. With a subsidence of the land came a change of climate, and the consequent disappearance of these ancient forests, and the increase of bogs and peat-mosses, may be looked upon as the effect, not the cause, of this altered climate. Latitudes which then were characterised by luxuriance of growth, now bear but a sparse vegetation. As an illustration, let me repeat that at Croy, Inverness-shire, an old and extensive forest of oak, birch, fir and hazel, has been found—converted into moss, in some places upwards of 20 feet deep. In the moss there, 400 feet above sea-level, oaks of extraordinary size were dug up, some measuring from 50 to 60 feet in length and proportionally thick, and even at 800 feet large blocks of fir were found where now the dwarf-willow can scarcely stand.² Further south, at Dalserf and at East Kilbride, large oaks, over 60 feet length in trunk, have been got in mosses about 500 feet above sea-level, where no large oak would now grow.³ Such facts carry the age of some mosses rather far back for chronological written history, and other facts bring their history down to recent years. Thus it is said that:—“About the middle of the 17th century on Loch Broom, Ross-shire, over the site of a decayed forest, peat was dug in less than 50 years. In 1756 the whole Wood of Drumlanrig, Dumfriesshire, was blown down and experienced a similar fate.”⁴ In 1830 a

¹ *Memoirs of Sir John Clerk of Penicuik*, pp. 310-1.

² *New Statistical Account of Scotland*, XIV., p. 449.

³ *Munro's Scottish Lake-Dwellings*, p. 265.

⁴ A. Geikie's *Scenery of Scotland*, p. 390, 2nd Ed. Cf. *Trans. Inverness Scientific Society*, III., p. 198:—“In Ross-shire in 48 years a tract of fine forest gave place to a moss in which fuel was cut.”

hurricane blew down in a single hour 4000 full-grown trees on the Hill of Cromarty, and Hugh Miller¹ looking on the scene of destruction—the masses of fallen timber cumbering the ground, and the moisture and water gathering and settling there—was struck by the thought that in this scene he had the origin of full one half of our Scottish mosses exemplified. “Some,” he says, “of the mosses of the South date from the time of the Roman invasion. . . . Some . . . are of still more modern origin ; there exist Scottish mosses that seem to have been formed when Robert the Bruce felled the woods and wasted the country of John of Lorn. But of the others not a few have palpably owed their origin to violent hurricanes.”

Let me further draw upon our Scottish mosses for detailed illustrations of the extent of our ancient woodlands, always bearing in mind the chronological difficulty I have mentioned, and also premising that my illustrations are casual, gathered by the way, as it were, and make no pretence to deal fully with this branch of the subject.

Five miles from Carrbridge, on the new railway line between Aviemore and Inverness, at the summit level (alt. 1323 feet) is an extensive cutting where a great bed of moss was encountered, in which, at the depth of 25 feet, three successive crops of fir could be traced, each buried three feet under the other. At the present day no trees seem to be able to grow here. “In many parts of Strathspey, now bleak and bare, labourers in the course of excavations have turned up trunks of trees, enormous in their dimensions, from the moss, where they had lain for centuries.”² “At Ardross, Rosskeen, large logs of bog-oak are turned up in peat-cutting, a piece of which, sent to the Forestry Exhibition in Edinburgh in 1884, was awarded a certificate.”³ Near Cromarty Hugh Miller found in one place the decaying remains of huge oaks, cups of acorns, handfuls of hazel-nuts, twigs of birch, and even leaves of these three species preserved in layers of a sort of unctuous clay.⁴ Under the shallow waters of Burghhead Bay, rooted in a muddy, peaty soil, are to be seen the roots and boles

¹ *My Schools and Schoolmasters*, p. 465.

² *Nairne's Notes*, p. 23.

³ *Trans. Gaelic Society Inverness*, XII., p. 335 ; R. MacLean.

⁴ *My Schools and Schoolmasters*, p. 70.

of pine-trees in a well-preserved state. In many localities in the ancient province of Moray, *e.g.*, in the glens of Tromie and Feshie and Guisach, and on the now bare mountain-sides of Cairngorm, Ben Muichdhuì, Ben Aigan, the Convals, the Carn districts and the Monadhliath range is indisputable evidence of ancient woodlands, where now no trees, or but few, stand.¹

In the forest of Mar large trunks of Scots fir are found immured in peat; on Bennachie during peat-cutting, hazel was the wood chiefly found; near Loch Builg, at the root of a stump in the moss, a horn of *Bos albifrons* (? *longifrons*) was discovered; in Glen Muick, the mosses contain numerous remains of what is called the "ancient Caledonian Forest;" the sections cut by a tributary of the Tarf (*Allt a' Chaorruinn* = Rowantree Burn), Glen Tilt, show numerous old roots of trees; and, about the head-waters of the Dee and near Derry Lodge, burnt wood is frequently found, below moss and tree roots, at a depth of from two to three feet—even *three* depths or layers have been found.² In the west, the upper portion of Glenorchy and the haunches of Ben Cruachan, and from beyond Tyndrum on to the King's House, show decayed roots of trees, many of them of large size³—Dorothy Wordsworth noticed this in the course of her Tour in 1803. In her *Recollections* (p. 181) she says,—“We passed neither tree nor shrub for miles—I include the whole space from Glencoe [to Inveroran]—yet we saw perpetually traces of a long decayed forest, pieces of black mouldering wood.” Pennant observed the same feature and wrote,—“Pass near Loch Talla, a long narrow piece of water, with a small pine wood on its side. A few weather-beaten pines and birch appear scattered up and down, and in all the bogs great numbers of roots, that evince the forest that covered the country within this half century. These were the last pines that I saw growing spontaneously in North Britain.”⁴

At Carse, near Tarbert, Lochfyne, the decayed root of an oak tree may be seen *in situ* cropping out above the moss. Ballachulish Moss . . . was, like the rest of Lochaber, thickly covered with native wood of large and luxuriant growth, as the huge boles and

¹ *Vertebrate Fauna of Moray*, pp. 124, 5, 9.

² *Cairngorm Club Journal*, I., pp. 238, 65, 55, 315.

³ *Vertebrate Fauna of Moray*, I., pp. 124-5.

⁴ Thos. Pennant's *Tour in Scotland* (1769), 4th Ed., Lon. 1776, p. 232.

roots still surviving *in situ* abundantly testify (Rev. Dr. A. Stewart).¹ Moniack Moss (in the Aird) is an extensive flat of cultivated reclaimed land. In the moss many stumps and trunks of trees (oaks) of great size were dug out, and may still be seen lying about the edges of the fields.² Mr. J. Milne says,—“For many years after the ditches were cut alongside both sides of the Strichen road, which bounds the farm [of Curnichal] on the north, large trunks of decayed oak trees could be seen projecting into them, both from below the road and also from the fields on both sides. And, as the moss land has been reclaimed away to the north, both in draining and ploughing, trunks of oak trees have been come in contact with. And again when the railway was made, trunks of trees were exposed, showing that a wood of some size extended from Curnichal away northwards.”³

Perthshire abounds in testimony.⁴ In Balquhiddie large trunks of birch, as well as oak trees, are occasionally found, evidently belonging to a defunct forest; remains of the ancient forest of Birnam have been found at different times; in Ladywell Wood the Duke of Athole's forester came across several noble oaks embedded in the earth; at Murthly remains of oaks, birch, hazel and alder have been found in similar conditions; Fortingall (Glenmore) yielded a large crop of the roots of fir trees (remains of the ancient forest of Schiehallion) which served as excellent fuel, and when burning “emitted a light surpassing the brilliancy of gas,” and the trunks of oaks were also turned up here; shortly before 1793, 40 large oak trees were found lying close together by their roots in Kincardine Moss; Blair Drummond Moss has also yielded large oaks; at the bottom of Flanders Moss, trees are found lying prostrate, marked by the axe of those who felled them, (probably the Romans,) as are also many of the fallen trees of Kincardine and Blair Drummond Mosses; on Tullibardine Muir, 4 or 5 feet underneath the moss, and at 600 to 700 feet above sea-level the bole of a magnificent oak was discovered about 1879, measuring 4 feet in diameter; and at Gorthy, trunks of birch and oak have been obtained from time to time buried 6 feet under the moss.

¹ *Trans. Inverness Scientific Socy.*, II., p. 25.

² *Ibid.*, III., p. 120.

³ *Trans. Buchan Field Club*, IV., p. 216.

⁴ *Hunter's Woods, Forests and Estates of Perthshire*; *passim*.

Such facts are not new discoveries, for Bishop Leslie writing in 1578, referring to the "Kingdom of Fife," says:—"Bot this causes men meruellouslie to wondir that vndir that earth ar fund grat stokis and blokis of wonderful akes and vthir tries, sum rottin throuch aldnes, sum agane fresch and hail and for bigging nocht unmeit: for that thir tries sumtyme grew in thir places is cleirer than the nune day, and that throuch force and nocht throuch age they haue bene brocht out is euident aneuch, quhen mony of thame, as said is, remanes yet nocht wormetin and uncorrupte, bot freshe and fyne and meit to be put in vse."

In more southern districts, at Kilbarchan, more than 100 years ago, a layer of deep white clay, underneath a moss 7 to 9 feet deep, contained the stumps and remains of a wood—the oaks perfectly fresh and the other kinds of timber rotten;¹ in Darnley Glen, when recently digging foundations for a new Crushing Mill, a large old oak with branches still attached was found buried underneath the bed of the burn, and similar old oaks have turned up in other places in the glen, where digging has been done in connection with the Arden Lime Works; in Maxwell Park, Glasgow, are to be seen old stems and roots of trees, mostly oak, many of which were dug up when the park was being formed, and the peat and moss extend to a considerable extent over the adjoining lands; during some excavations at Holyrood curling pond, Edinburgh, a large Scots fir about two feet in diameter was found lying in a bed of peat, about five feet from the surface; in the Gartcosh direction peaty moorland abounds, lochs breaking it up and showing stumps and remains of trees washed out by the water—the lochs, such as Woodend, being sometimes fringed by patches of natural wood, mostly birch; at St. Quivox (Ayrshire) part of what is called the "Great Moss" still exists, and evidence is afforded, by the numerous roots of trees which have been dug up in the vicinity, that the soil had been thickly studded with timber at some period or other;² in the hollow at Manorhead (Peebles), more than 1000 feet above sea-level, as in the channels of other streams thereabouts, birch boles have been found inlaid in the sand and peat;³ at the foot of Loch Dungeon, Galloway,

¹ Old *Statistical Account*, XIV., p. 484.

² Paterson's *History of Ayrshire*, I., pp. 2, 262.

³ Veitch's *Scottish Border*, I., p. 13.

the water has washed the soil away and exposed the roots of an old thicket of fir trees, and on the hills of Kells and Minnigaff the roots of large oak trees may be seen, and, where peats are cut in deep moss, the spade goes through branches of birch and hazel, and trunks of oaks are found with the wood quite fresh;¹ remains of oak trees preserved in peat-bogs attest that this tree once flourished as a native in the vales of Ettrick and Yarrow;² the whole region of the Lammermoors was overspread with wood at a remote period;³ and the same observation, it seems to me, may be made as to the Campsie Fells and other hills in the Clyde district. For example the names Fereneze and Gleniffer seem to point to these districts having been tree-clad, mostly with alders (Gaelic, *fearna* = alder), and it is within the recollection of old men that they have seen the Gleniffer Braes covered with trees. Their remains abound in places such as on Duchallaw.

As to the Western Islands, the following passage does not fall short in retrospective imagination:—"All these islands and western shores once waved with giant trees that would rival the American backwoods. The impenetrable forest of Calydon extended all over Argyle, its terrible depths, peopled by wild bulls, boars and bears, and wilder Britons, formed an impassable barrier even to the invincible legions of Rome. In the peat-mosses, which cover so large an extent of the Western Isles, roots of forest trees in great quantities are found in the position in which they grew, 5 or 6 feet beneath the surface of the super-accumulated moss. On a steep rocky bank by the house [Ardlussa, Jura, in 1861] stands a most venerable witness to this fact in the presence of a hollow-hearted, old oak tree, 21 feet in circumference, though very dwarfed in height. A great part is dead, but some boughs yet had leaves. . . . Edinburgh savants opine that this tree is more than 1500 years old. Another smaller one, a mere boy, which has probably not yet seen 1000 summers, stands near."⁴

The case of Tiree may be mentioned, as it is interesting and instructive, and probably reliable. It is of this island that the story of Dr. Johnson warning Boswell to take care of his stick, as

¹ *Trans. Dumfries and Galloway Nat. Hist. and Antig. Socy.*, No. 12, p. 135.

² *Berwickshire Naturalists' Club History*, VIII., p. 478.

³ R. Chambers's *Picture of Scotland*, I., p. 45.

⁴ H. D. Graham's *Birds of Iona and Mull*, 1890, p. 164.

it was the best piece of timber he had seen in the Western Isles, is told, but these travellers were never in Tiree, although they visited the neighbouring island of Coll. It was in Mull that the Doctor's oak stick was lost—"Consider, Sir, the value of such a piece of timber here." This was in 1773. Now, as then, there is not a tree on this fertile island (Tiree), and endeavours to introduce them have failed, and the peat-moss has itself been almost exhausted. Yet 50 years ago and earlier, roots or portions of trees were found in numbers when peat was being cut, evidently the remains of a blown wood, probably oaks and hazels.¹ For such trees to attain any size Tiree must have afforded such shelter as it does not do to-day, and the configuration of the land must have been different, and so we are carried back to pre-historic times. Orkney and Shetland furnish evidences of such a land-movement, as submerged trees may be seen at several places, namely, Otterwick Bay (Sanday), Millbay and Roithisholm (Stronsay), Westness House (Rousay), the west side of Westness and at Hoy, all in Orkney.

The abundant use of wood by the early inhabitants of Scotland shows that they had it in great plenty. Timber was for many ages the staple material for house-building, and the only material for boat-building. So late as 1746, at the Cross of Dundee there were not more than four or five houses built of stone. In early times we have evidence of the presence of abundant and large trees from the use made of timber in building. Without going into details it may be stated that the natives dwelt in wooden huts or houses in preference to cave-dwellings; that their villages were surrounded by a wooden stockade; and that the Romans, as a means of defence, erected a palisade of stakes of timber round their temporary camps or halting places. The natives further sought security by forming timber lake-dwellings or crannogs in which they could isolate themselves, and which were inhabited as early as the Bronze Age, and, in Strathclyde, down till its final conquest by the Saxons. In the Celtic area they were occupied even till the middle of 17th century, but these were then really mediæval island-castles. The castle on the island in Loch-an-Eilan (Strathspey) is an old crannog, (now a mediæval castle in ruins), and with

¹ *Annals of Scottish Natural History*, No. 25, pp. 33-4; S. M. MacVicar.

its present surroundings of the great and thick pine-wood of Rothiemurchus, the roots of the trees washed by the water of the loch, it probably presents a closely similar aspect, so far as its surroundings are concerned, to that which it did when the early lake-dwellers occupied it—a sight not easily seen elsewhere. For instance, Dr. Munro¹ says of the lake-dwelling which this Society visited on one of its excursions at Mid Buston, Kilmaurs—"The topographical features and environments of Loch Buston, when the crannog-builders commenced their operations, were totally different from what they are now. Then a stagnant lake, deeply encroached upon by a marginal zone of aquatic plants, and surrounded by a forest of oaks and other indigenous trees, occupied the site of the present fertile basin; now . . . scarcely a tree marks the once wooded locality, part of which is still significantly known as the Shaws. . . . I question if there is an oak tree growing in the whole of Ayrshire, from which a dug-out canoe having the dimensions of the one found at Loch Buston could be made." This canoe is 22 feet in length. Dug-out canoes do not necessarily carry us back to pre-historic times, but they are the earliest form of boat which our native shipbuilders have left to us. It is curiously significant that so many have been found on the Clyde—to-day the shipbuilding centre of the world. Then it must have produced fine oak trees, as now it produces coal and steel.

The earliest type of castle in Scotland, which belonged to the Celtic period, took the form of a wooden hall, enclosed in a space surrounded by an earth-rampart having on the top a palisade of stakes closely set together, their lateral branches left on and interlacing with one another. Such a castle was that of Cullen. Coming down to 563 A.D., a definite date, when the earliest monastery in Iona was established, it is clearly stated that the principal buildings were entirely constructed of wood and wattles. The wood is not likely to have been grown on Iona; but it may be stated with certainty that the timber used in constructing these early Scottish edifices—crannogs, huts, palisades, castles and houses, as well as the canoes, was native grown, and abundant in many localities. A curious side-light bearing on this point may

¹ *Ancient Scottish Lake-Dwellings*, pp. 265-9.

be seen in a theory enunciated by Mr. W. Copeland Borlase in his elaborate work on the *Dolmens of Ireland* (1897) which, although having direct reference to the sister Kingdom and applying mostly to pre-historic man, seems to me worth mentioning here. Mr. Borlase contends that these ancient stone monuments, often huge in size and set up on high ground, were for the most part put in place by the aid of trunks of great trees, felled in the native woods, and used both as rollers to carry the stones and as levers to propel and raise them, large gangs of people being employed in the work.

Native iron was worked and manufactured in this country from very early times; there seems reason to believe that Julius Cæsar found forges at work in the Weald of Sussex and Kent when he invaded South Britain (B.C. 55). To smelt iron, fuel is required, and up to so late a date as 1760, when the Carron Company commenced using coke, wood or its product, charcoal, was the only fuel used. Of these later furnaces in relation to our woodlands the story is clear and simple; but in the meantime I wish to briefly indicate the extent and distribution of the earliest forges and furnaces in Scotland, keeping in mind the fact that, contemporaneously with them, must have been present the means of obtaining fuel—wood and timber or perhaps peat. Traces of these “bloomeries” are to be found in the following counties,—Aberdeen, Argyll, Ayr, Banff, Berwick, Bute, Dumbarton, Dumfries, Elgin, Inverness, Nairn, Perth, Stirling, Ross and Sutherland. I further specify some localities not far from our own city,—Tarbert and Rowardennan (Loch Lomond), Duchray Moor, Benmore (Cowal), Skipness, Strachur, Strachlachan (several, in the largest of which, at Esmore, the following varieties of wood have been identified amongst the refuse—birch, oak, holly, ash, elm and beech), Stonefield House, Loch Goil, Glendaruel (several), and in Arran at Glen Kill (three places), Gortonalister (Lamlash), Largiebeg, Cnoc Dubh (two), Shiskin, Glencloy and Loch Ranza.¹ I have already sounded a warning note chronologically when I mentioned the date 1760, and it seems certain that many of these works are of more recent date than what I call “early times,” as indeed their comparatively fresh state shows; but that they (or such-like) have been in operation

¹ W. Irison Macadam's *Notes on the Ancient Iron Industry of Scotland*.

for many centuries is borne witness to by the remote period of the beginning of our Iron Age.

The names of places often preserve the recollection of topographical features and historical events in a country or district, long after these events and features have passed away. The names of the greater natural features of a landscape, such as islands, mountains, rivers and lochs, have a wonderful permanence all over the world, and amongst widely scattered races of people, who, seeing such things as they really are, seldom failed to attach a distinctive name to each, by which they *described* the place or scene. Thus a place-name tells a story, and as you may have gathered from the references I have already made to such names as Caledonia and Dunkeld, Scottish place-names are not silent as to our woodlands and forests. I have a list of some names derived from such sources, and dealing, as I am now, with the earliest historic times, only names in the languages of the earliest known inhabitants or the invaders of their country—the Romans—are admissible at present. Such few names as the Romans have left on the face of our maps are of no service in this connection, as they scarcely touch on natural features, but the Celtic peoples whom they endeavoured to crush have thickly marked the country with good descriptive names. But a branch of the Celtic tongue, Gaelic, is a spoken and current language to-day, and in this fact lies a chronological difficulty which makes the treatment of these place-names far from easy at present. That is to say, the Gaelic name of a place may have been given to that place only yesterday or it may have been given more than 1500 years ago; consequently each name has to be traced to its origin to find the date or period at which the description conveyed in the name was applicable to the place named. Dunkeld, for instance, in another spelling, is Duincaillen, found as far back as 865, at anyrate; and doubtless, other names in my list boast a similar antiquity. But this is not the place nor time to demonstrate this, and it must suffice to say that, at anyrate, five Gaelic words (*coille*, *fiodh*, *fàsach*, *frìth* and *ros*) conveying the general meaning of a wood or forest occur as components frequently in our place-names, and the Brythonic word *coed*, with a similar meaning, also occurs; another Gaelic word, *dinat*, means a wooded glen; six words in the same tongue (*mhuine*, *bad*, *creathach* or *crionach*,

foithrie and *garan*) apply to bushes, brushwood or thickets; and five others, in different Celtic dialects (*craobh*, *crann*, *preas*, *ceap*, and *bile*) mean a tree. Then the following species of trees are represented in our Gaelic place-names—the elm (*leamhan*), willow (*seileach*), oak (*darach*), Scots fir (*cona*), pine (*giubhas*), birch (*beithe*), apple (*abhail* or *ubhal*), alder (*fearna*), yew (*iubhar*), juniper (*aiteal*), holly (*cuilionn*), mountain ash or rowan (*caora* or *caorrunn*), elder (*droman*), blackthorn (*draighneag*), hawthorn (*sceach* or *sgitheach*), bramble or thorn (*dreas*), ash (*fuinnsean* or *uinseann*), hazel (*coll* or *calltuinn*), and aspen (*critheach*). The distribution of place-names in Scotland containing these words is general and wide, often extending into districts where Gaelic has not been spoken for long generations, as could be readily illustrated by examples from my list; but the mention of this phase of my subject must suffice at present. On some subsequent occasion it may be more fully considered, and something also said of the later history of our forests and woodlands.

XII.

ENTOMOLOGICAL REPORTS.

BY GEORGE W. ORD.

1895-6.

(Read 4th March, 1896).

ENTOMOLOGISTS, like farmers, are considered chronic grumblers. With them the season is always either too dry or too cold, too windy or too wet. For once Glasgow entomologists at any rate have good subject-matter for grumbling, in the gradual destruction of Cadder Wilderness, the haunt of every man of them from the first time he sallied forth net in hand. Coal-pits, and railways in connection therewith, are rapidly taking the place of one of the finest stretches of wooded land in the West of Scotland.

During the Session 1895 five Excursions were arranged by the Entomological Section, all of which were fairly successful, although the attendance left much to be desired. The great feature of the season was the early appearance of some insects and the extraordinary abundance of others. As early as the 1st of June, *Larentia didymata* and *Plusia gamma* were abroad. The first of these does not usually make its appearance in the West of Scotland till the middle of July, while the Silver Gamma is ordinarily most abundant in September. Down in the south of Ayrshire, however, it is a July insect, and the difference in its time of appearance in the two localities is one of those puzzles which the entomologist is perpetually trying to solve. It is just possible that it is double-brooded, and certainly its early appearance last year would seem to point in that direction. *Larentia didymata* is one of our commonest and most wide-spread insects, but last year it not only justified this title, but extended its time-limit also, by appearing six weeks earlier than usual; nor did it make up for

this by disappearing early, as it was still flying in considerable numbers at Drymen in September. It is also apparently double-brooded in certain seasons. A single example of *Vanessa atalanta* was also observed on the 1st of June, but this was probably a hibernated specimen. The Red Admiral is not so much given to hibernation as other species of the genus, but, considering the great numbers that were flying late in 1894, it would have been very odd if none of them had survived the winter. It was, however, the Small Copper Butterfly, (*Polyommatus phlæas*), which gave the really distinctive character to the season. This little insect, which is double-brooded, appearing both in May and August, is not usually to be seen in great numbers in the neighbourhood of the city, and I have no recollection of having seen till last year a single one in the springtime nearer than Bowling. Last year it was flying everywhere at the end of May and beginning of June—Possil, Giffnock, Milngavie, banks of Cart, and every locality visited by members of the Section was swarming with it. It even ventured into the centre of the city, and stray specimens were brought to me from Parliamentary Road and Buchanan Street. It was equally abundant in the autumn. Among other insects more plentiful last year than usual, we may mention the little blue Dragon-fly (*Agrion elegans*), which was very abundant at Possil and Milngavie; and the large Caddis-fly (*Phryganea striata*) also seemed to be much more numerous and widespread than usual, though by no means common.

This sporadic appearance of certain insects in great numbers has always been a mystery to entomologists. That there are good and sufficient reasons goes without saying, but mother nature has locked in her bosom the secret of what these causes really are. According to entomological tradition the Red Admiral has a habit of appearing this way every seven years, the last occasion being in 1894. The members of the section, not being able to speak for many periods of that length, cannot affirm either the truth or the untruth of this legend. We have, at anyrate, a plausible explanation for the phenomenal abundance of the Small Copper and certain other insects last year. They pupate on or near the surface of the ground, where they become the ready prey of the shrew, field-mouse, birds, etc. The winter of 1894-5 was so severe, and the frost lasted so long, that the pupae were far better

protected than usual from the attacks of their four-footed and feathered enemies, and therefore more of them survived the winter. This explanation does not apply to the Dragon-fly, however.

Last year was also exceptional on account of the number and variety of insects that were seen in the centre of the city. Besides the Copper, already mentioned, the following, amongst others, were seen:—*Pieris brassicae*, *P. rapae*, *P. napi*, *Vanessa atalanta*, *V. urticae*, *Lycaena alexis*, *Smerinthus populi*, *Hepialus humuli*, *H. velleda*, *Notodonta camolina*, *Triphaena pronuba*, *Noctua plecta*, *Apamea oculatea*, *Hadena dentina*, *Crocallis elinguararia* and *Tanagra chærophyllata*. Most of the moths were seen around the electric lamps in the evening, the most conspicuous being, of course, the Ghost, the size and colour of which seem greatly to draw the attention of passers-by. Our only common large Dragon-fly, *Aeschna juncea*, might also have been seen careering through the streets, and the largest of the "Daddy long-legs," *Tipula gigantea*, seems to find the walls of Sauchiehall Street hotels peculiarly restful and comforting. It must not be supposed that all kinds of insects were abundant last year. *Mamestra brassicae*, for instance, was exceedingly scarce, both in the imago and the larval state, and many other insects seemed to be in fewer numbers than usual.

Among the rarer insects recorded by the Section the following may be mentioned:—Lepidoptera—*Acherontia atropos*, *Venilia maculata*, *Ennomos tiliaria*, *Emmelesia decolorata*, and *Mixodia palustrana*; Coleoptera:—*Elaphrus cupreus*, *Cychrus rostratus*, *Carabus glabratus*, *C. nitens*, *Silpha tristis*, *Aphodius inquinatus* and *Phyllopertha horticola*. Of *Venilia maculata* a single specimen was taken by Mr. R. Henderson, in Mugdock Woods, near the same place, and about the same date, as it was taken by the writer five years ago. Yet it has not been seen there in the intervening years, nor has it been taken anywhere else in the West of Scotland. *Ennomos tiliaria* turned up at Drymen, and Mr. A. M'Corkle recorded the Death's Head from Kirn. A specimen of this rare and beautiful insect, from Giffnock, was also shown before the Society recently.

Some work has been done in the orders Hymenoptera and Diptera, and a commencement will be made with the Hemiptera this season. The attempt of the members to re-introduce certain

insects which have almost become extinct in our immediate neighbourhood has only been partially successful. *Arctia caja* and *Orgyia antiqua* appear to have taken hold in certain localities, but, so far as can be seen, *Vanessa io*, *Bombyx rubi*, *B. quercus* and *Arctia fuliginosa* have been complete failures.

1896-7.

(Read 3rd March, 1897.)

THE report of the Entomological Section of this Society appears to be degenerating into an annual grumble about the weather. Certainly in no season hitherto chronicled has the Section been more unfortunate than during the year 1896. Nine excursions were arranged for, but in almost every instance the rain stepped in and interfered with the accomplishment of our intentions, so I am saved the trouble of giving a detailed account of most of them. Curiously enough the only excursion which in any way calls for comment was entirely informal, as it took place on a day previously annexed for the general purposes of the Society (21st May). That excursion was to the islands of Loch Lomond, Inchtavannach, Inchconnachan, and Inchmoan; and although we failed in our immediate object—refinding the exact locality for *Collix sparsata* recorded by me for Inchtavannach some years ago—yet in other respects our visit proved most successful indeed. In the first place, we added two species of moths to the list previously recorded for the district—*Acidalia immutata* and *Boarmia abietaria*. Of the last only one was taken, and that fell to the lot of Mr. A. M'Corkle, but the *Acidalia* was comparatively abundant. In addition to these some other notable insects were met with, including *Thecla rubi*, *Iodis lactearia*, *Panagra petraria*, *Euclidia mi*, *Platypteryx lacertinaria*, and one or two interesting species of phytophagous beetles. *Iodis lactearia* and *Panagra petraria*, both of which have been previously recorded

for Loch Lomond by members of the Section, (single specimens of each having been taken at a previous excursion to the district), were found rather plentifully on Inchconnachan, and the Green Hair-streak was exceedingly common on Inchmoan. But on that island the most remarkable capture was undoubtedly *Euclidia mi*, not perhaps on account of the rarity of the insect, but on account of the time of the year, for this rather handsome, day-flying moth is seldom seen on the wing in Scotland before the month of July. One of the most striking features of Inchconnachan was the number and size of the ant-hills, literally black with the multitude of their inhabitants. What these ants were doing we could not at all make out, but they were all on the move continually, now going one way, now another, and apparently without definite object or purpose, behaving very much after the fashion of a Glasgow holiday crowd at Rothesay.

The most notable event of the year to the Entomological Section of the Society was the appearance in great abundance on the banks of the Allander of three species of insects not previously noticed by us in this, our favourite, locality. These were the Green Hair-streak, *Thecla rubi*, already mentioned; *Emmelesia decolorata* and *Phytometra ænea*. As if to further confirm our theory as to the food-plant of the Hair-streak being the birch, it was this tree that we found the insect frequenting in both the new localities discovered by us last year. *Phytometra ænea* usually appears well on in the summer, but it was in full flight last year on the 24th May. Another early appearance was that of *Hepialus velleda*, which usually appears at the beginning of July, but last year was observed at the end of May. The commonest of our large Dragon-flies, *Aeschna juncea*, and a few other insects were also early on the wing, but although the opening of the season was so auspicious, what followed was hardly in keeping. Many of our commonest insects—the genera *Plusia* and *Melanippe* for example—were curiously scarce, and the later summer and autumn were entirely featureless. Butterflies were quite as scarce as Moths, and nothing of outstanding interest falls to be recorded about them. I may mention that during the early part of September I stayed four days at Newbury, in Berkshire, and during that time I only saw one single Butterfly, a poor wasted specimen of *Hesperia actæon*. Mr. James J. F. X. King reports that *Scopula*

decrepitalis could not be found last year in its usual locality, and that *Phibalapteryx lapidata* was much scarcer than in the previous year. In addition to these already mentioned two other species of Macro-Lepidoptera were added to our list during the year—*Bryophila perla* and *Ephyra punctaria*. Mr. R. Henderson also picked up at Tarbert a very interesting beetle—one of the Rose-chafers, *Trichus fasciatus*. *Cetonia floccicola*

It was our intention at the beginning of the year to take up the Hemiptera of the district systematically, but I am sorry to say that progress in this direction has not been so great as we expected. In regard to the Diptera, some work has been done in the group *Tipulidæ*, principally in the two genera *Pachyrrhina* and *Tipula*. At the first meeting of the Session I submitted a partial report of the work done by this Section since its formation, and at the same time I laid on the table a fully detailed list of the Macro-Lepidoptera of the district, founded entirely on the work of the members of the Section.¹ I have also to report that at the beginning of the year we were enabled to hand over to the authorities of Kelvingrove Museum a collection of over 100 typical species of British Hymenoptera, Diptera and Hemiptera, and we hope to be able to do more in this direction in the future.

¹ A copy of this is engrossed in the Minutes of the Society, and the substance of it, with additions, is to be published in the hand-book now in preparation for the meeting of the British Association in Glasgow in 1901 (Ed.).

EDITORIAL NOTE.

The above reports are printed here as a memorial of the writer, George Walker Ord, who was Convener of the Entomological Section of this Society from 1893 till his untimely death on the 9th August, 1899, at the early age of twenty-eight. At the meeting in September, our President, Mr. John Paterson, read an "In Memoriam" notice, the substance of which is printed in the *Annals of Scottish Natural History* (Oct. 1899, pp. 193-6), and Mr. Robert Henderson of this Society also contributed an "In Memoriam" notice to the *Transactions of the Natural History Society of Glasgow* (Vol. V. (N.S.) 1900, pp. 319-21). Consequently it is sufficient here to say that by his death our Society has lost one of its most active and capable members, and one who frequently contributed in various branches of natural history to its proceedings, for while his favourite subject of research was entomology, he was, in the first place, a good naturalist. As such, and as a man, we mourn his death, and would commend to his fellow-members the spirit which runs through such work as is here given the permanency of paper and type.

XIII.

TIPULIDÆ IN INVERNESS-SHIRE.

BY ROBERT HENDERSON.

(Paper read 1st December, 1899, and 2nd February, 1900.)

WHEN, through the goodness of Mr. James J. F. X. King, F.E.S., the collection of Tipulidæ made by him at Guisachan (a seat of the Rt. Hon. Baron Tweedmouth), in Inverness-shire, from June 15th till August 19th, 1899, was placed in my hands for determination, I gladly undertook the work. Being engaged in the study of the group and the preparation of a list of the species occurring in the Clyde area, I was much interested in the opportunity thus afforded of becoming acquainted, in a measure, with another area, and in having placed at my disposal the means of instituting a comparison of the distribution of species in the two districts. At the present time the student can, for the most part, make such comparisons by direct observation alone, records being extremely few. For the county of Inverness I have not been able to find more than two records, viz., *Limnobia trivittata*, Schum., and *Rhypholophus similis*, Staeg., noted by Mr. G. H. Verrall in the *Entomologist's Monthly Magazine* for 1886.

In addition to the interest afforded by extending one's knowledge of the distribution of species, there was also the hope of finding in the collection some species which one had not met with in Clydesdale, and in this I was not disappointed. Besides the three species referred to more fully below, I was pleased to see *Rhypholophus varius*, Mg., and *Tipula excisa*, Schum., which were previously unknown to me; and there were a few examples of species which I had only met with singly in this district, but these need not be specified here.

Altogether I have been able to identify 57 species, leaving three for further investigation. These three species are :—(1) A species of *Dicranomyia*—entirely ochreous with dark stigma, which I have not been able to find a satisfactory description of. (2) Three examples of a species of *Dactylolabis*, the identity of which I am not quite satisfied about. If it does not prove to be *D. tergestina*, Egg., it resembles it pretty closely. *D. Frauenfeldi*, Egg., and *D. gracilipes*, Lw., are the only species of this genus recorded for Britain, and of the former I took a pair at the Society's excursion to Fiddler Gill, in May, 1897. (3) A Tipulid, which appears to be very closely related to *T. montium*, Egg., a species unrecorded for Britain. I have also some examples of the same species, whatever it may be, taken in Clydesdale.

I am indebted to Mr. King for the following note on the locality. The district in which the flies were collected lies at the head of Strathglass, about 20 miles S.-W. by W. from Beaulieu. The strath is nicely sheltered by moderately high hills, and the soil seems to be much richer than in other parts of the Highlands. Guisachan is a well-wooded estate, and contains many introduced trees, which grow with great luxuriance. The beeches, oaks, and great maple trees are well grown, some clumps of the first-named being as fine as any to be seen in Scotland. The country is well provided with water in the form of lochs, streams, etc., and many of the specimens were taken near small streams by sweeping the heather overhanging the banks, although a number were taken in the open. During the period in which they were collected the weather was very dry on the whole, and at times the heat was excessive.

FAMILY PTYCHOPTERIDÆ.

1. Ptychoptera scutellaris, Mg.

FAMILY LIMNOBIDÆ.

2. Limnobia bifasciata, Schrk.
3. L. quadrinotata, Mg.
4. L. nubeculosa, Mg.
5. L. flavipes, F.
6. Dicranomyia mitis, Mg.
7. D. chorea, Mg.
8. D. sericata, Mg.
9. D. stigmatica, Mg.
10. D. sp. ?

11. D. didyma, Mg.
12. D. dumetorum, Mg.
13. D. morio, F.
14. Rhipidia maculata, Mg.
15. Antocha opalizans, O-Sack.
16. Goniomyia tenella, Mg.
17. Molophilus appendiculatus, Staeg.
18. M. propinquus, Egg.
19. M. biflatus, Ver.
20. M. obscurus, Mg.
21. Rhypholophus lineatus, Mg.
22. R. nodulosus, Mcq.
23. R. similis, Staeg.

24. *R. varius*, Mg.
25. *Erioptera tænionota*, Mg.
26. *E. fuscipennis*, Mg.
27. *E. trivialis*, Mg.
28. *Ephelia submarmorata*, Ver.
29. *E. marmorata*, Mg.
30. *Dactylolabis* sp. ?
31. *Limnophila Meigenii*, Ver.
32. *L. dispar*, Mg.
33. *L. lineolella*, Ver.
34. *L. aperta*, Ver.
35. *L. ochracea*, Mg.
36. *L. discicollis*, Mg.
37. *L. lucorum*, Mg.
38. *L. nemoralis*, Mg.
39. *L. filata*, Wlk.
40. *L. senilis*, Hal.
41. *Amalopsis immaculata*, Mg.
42. *A. littoralis*, Mg.
43. *Pedicia rivosa*, L.

FAMILY TIPULIDÆ.

44. *Dolichopeza sylvicola*, Curt.
45. *Pachyrrhina histrio*, F.
46. *P. annulicornis*, Mg.
47. *Tipula confusa*, V. de Wulp.
48. *T. longicornis*, Schum.
49. *T. pabulina*, Mg.
50. *T. varipennis*, Mg.
51. *T. scripta*, Mg.
52. *T. excisa*, Schum.
53. *T. flavolineata*, Mg.
54. *T. lunata*, L.
55. *T. sp.* ?
56. *T. Diana*, Mg.
57. *T. gigantea*, Schrk.
58. *T. lutescens*, F.
59. *T. paludosa*, Mg.
60. *T. ochracea*, Mg.

XIV.

RECORDS OF EXCURSIONS IN STIRLINGSHIRE.

BY ALEXANDER ROSS.

THOUGH not so numerous as the excursions through the counties of Lanark, Ayr and Renfrew, those to Stirlingshire have formed an interesting part of the Society's outings, and have been over country good from a botanical, geological and scenic point of view. Naturally the greater number of excursions has taken place to the western and central parts of the Campsie Fells and to the valleys and hills lying south of these.

The first visit to this county was on the 29th May, 1886, when Ballagan Glen was explored by the members in conjunction with the Geological Class of Mr. J. C. Christie. Of this and a few of the following excursions the records are very meagre. From Strathblane Station the glen is within easy walking distance. The bed of the Blane Burn, which rises in the highest peak of the Campsie Fells (Earl's Seat), was followed to where in its course it forms the exceedingly picturesque water-fall called the Spout of Ballagan. This cascade, having a fall of about seventy feet, sends down a column of sparkling water which contrasts wonderfully with the green of the vegetation and the varied colours of the bedded rocks. The section of the Fells exposed at this point is of the greatest interest to students of geology. The strata, which are known as the "Ballagan beds," appear in regular and almost horizontal layers. They belong to the upper calciferous sandstone group, the cement-stone series, and consist of thinly bedded grey and yellow sandstones, with dark shales, thin streaks of coal and layers of limestone. Dr. John Young in the *Transactions of the Geological Society of Glasgow*, Vol. I., says:—"Upwards of 230 beds of limestone, sandstone and marly shale

are seen lying tier upon tier in a slightly inclined position, and capped by massive beds of whitish sandstone and trap, the whole presenting one of the grandest specimens of stratification to be witnessed in the countryside." The results of weathering are seen in the accumulated sloping heap of broken rocks lying at the base of the section. The place of these beds in the geological formation of the surrounding country is above the lower carboniferous red sandstones and below the trap rocks of the Campsie range. They are seen outcropping at Fintry to the north, and also at Auchenreoch and Dumbuck Glens near Dumbarton. Thin layers of yellowish, fibrous gypsum are found between the beds, and some good specimens were taken out with the chisel. On the return journey Dunglass Hill, lying over against the mouth of Ballagan Glen, arrested attention. This hill (alt. 501 feet), rising abruptly from the centre of the Strathblane valley, consists of a great mass of trap which in its upheaval has caused the slight inclination found in the "Ballagan beds." It exhibits a good example of columnar structure. On the north-east face the columns appear to be almost horizontal, contrasting thus with the usual position of such columns, which is vertical. The only plants recorded at this excursion are Jack-by-the-hedge (*Alliaria officinalis*) and the great leopard's-bane (*Doronicum Pardalianches*).

Finnich Glen was visited on two occasions, 7th August, 1886, and 9th July, 1887. Of the former only is there a meagre record. The route taken was from Killearn, where, in the village, is a monument to George Buchanan, the scholar and reformer, who was a native of this parish. In Finnich Glen the party had an opportunity of witnessing the result of the resistless power of water as a wearing agent. The burn in the course of time has eaten its way through the sandstone and formed a deep ravine. At some parts the sides are remarkably precipitous, and look as if they had been cleft by a huge knife, while at others they slope somewhat, and the channel is widened out. At one part the stream branches and surrounds a huge mass of rock. The colours of the autumnal foliage seen in juxtaposition with the deep red of the sandstone formed a remarkably striking scene.

The Whangie was first visited on 6th August, 1887, and another visit was also made on 18th August, 1888, when the party approached it by way of old Mugdock Reservoir and Mugdock

Castle. The part of the castle fronting Mugdock Loch is used as a residence, while behind it stands the old tower with its ancient and hoary walls. The castle, though a residence of the Montrose family, is distinguished neither in history nor story. More interesting, at least to the botanist, is the little loch upon which it looks down, where Mr. George Gardiner made the first record for the district of the least yellow water-lily (*Nuphar pumilum*). From a slight eminence near the castle a splendid view of the terraced fronts of the Campsie Fells was obtained. The weathering of the hill-faces, from its similarity to the cañon scenery of North America, attracted much attention. Before reaching Craigallian Loch (a beautiful sheet of water lying in a sheltered hollow) the pretty grass of Parnassus (*Parnassia palustris*) and the field-gentian (*Gentiana campestris*) were seen. The sloe (*Prunus spinosa*) with an abundant supply of fruit also occurred before the Drymen Road was reached.

On the 5th June, 1897, another excursion to the Whangie was made by driving from the city through Maryhill and Bearsden to Auchineden where the party entered the grounds by the gate-house and reached the Whangie after a walk of about a mile obliquely along the steep side of Auchineden Hill (a spur of the Kilpatrick range), on the north-west face of which the celebrated chasm, which is about 350' feet in length and 40 feet medium depth, appears. Hugh Macdonald in his *Rambles Round Glasgow* (No. XVII.) gives a well-known description of the spot. While the party was examining the wonderful cleft the geologist of the company gave an explanation of the occurrence. The trap-rock of which the hill is composed is part of a great volcanic outburst which overlies the lowest beds of the carboniferous formation—the red sandstones. The sandstones, being much softer material than the trap, are more easily worn when acted on by denuding agencies. Hence the exposed edges of the sandstone have gradually crumbled away, and the support of the harder trap above being thus removed, a part of the latter has, by its own weight, broken off, and slid sufficiently to open up several feet. The late Mr. Dugald Bell tells us (*Among the Rocks round Glasgow*, Chap. VII.) that—"This is no isolated or exceptional occurrence; the Whangie is but the last of a series, and the evidences of former rock-slips strew the slope before us." The examination of the

chasm showed that in the narrower portions weathering had not been so active as in the wider. Here it was seen that projection and hollow were as sharply defined as when the original separation took place. The country in view from the hill is exceedingly beautiful. The Stockie Moor, Loch Lomond, studded with its green isles, and the bold Highland summits, with Ben Lomond towering in the foreground, afford a variety sufficient to please the most exacting eye. Among the plants seen were tubrous vetchling (*Lathyrus macrorrhizus*), the mossy saxifrage (*Saxifraga hypnoides*), the red whortleberry (*Vaccinium Vitis-Idæa*), the parsley-fern (*Cryptogramme crispa*), the Scottish filmy fern (*Hymenophyllum Wilsoni*), and the moonwort (*Botrychium Lunaria*). The entomologists devoted themselves almost entirely to Tipulidæ, commonly known as "Daddy Long-legs." Among those netted on the Drymen Road were *Dicranomyia chorea*, Mg., *Tipula hortensis*, Mg., and *T. obsoleta*, Mg. On the heather at the Whangie *T. pruinosa*, W., was flying in great abundance. Very few moths were seen, the most noteworthy being *Melanippe tristata*, L., and *Cidaria suffumata*, W.V. A specimen of the rather interesting beetle, *Rhagium bifasciatum*, F., flew into the second brake as it was passing Baljaffrey Wood, and the moors were alive with various species of click-beetles.

A joint excursion with the Natural History Society of Glasgow, on 12th September, 1896, had for its objective the Craigallian estate. Not much can be said about the scientific features of the excursion, as, owing to the season having been an early one, most of the plants and shrubs were past flowering. Along the approach to the Craigallian plantation, and in the fields adjoining, many plants of the little trailing St. John's wort (*Hypericum humifusum*) were observed, while along the margin of the wood on both sides of the road skull-cap (*Scutellaria galericulata*) was abundant. In the marshy ground by the side of the loch the grass of Parnassus (*Parnassia palustris*) and the devil's-bit scabious (*Scabiosa succisa*) were plentiful and in full flower. The remarkable size and abundance of the fruit on the shrubs and trees were particularly noticeable. Many bushes of the sloe (*Prunus spinosa*) were literally loaded with large and beautifully glaucous plums. No member of the party had ever seen such a rich crop of fruit on this shrub.

Earl's Seat, the highest summit of the Campsie Fells, and Fin Glen were visited on the 13th May, 1893. Detraining at Lennoxtown, behind which the Fells towered grandly in the clear air, the party followed the main road by way of the village of Campsie to the entrance of Fin Glen. Avoiding the glen, the route was taken up hill in search of an ancient wall or dyke known to be at this place. Directed by a farmer, the party was not long in reaching it. Situated at a height of about 1000 feet above sea-level, the wall is still, at certain parts, about eight feet high and twenty-four feet wide at the base. Tradition has it that it was built—very likely in imitation of the Roman Wall—by the Caledonians. There is no ditch in connection with it, and, generally speaking, it is higher on the north than on the south side, the reverse of what a Roman wall would be. A short distance from the wall lies a little mound about eight paces in diameter and three in height, probably the burial-place of some chief who fell in battle in those old fighting days. Close to this is Clach Arthur, a large boulder of trap, named after a famous Caledonian chief. From this point a splendid view of the valley was obtained. To the east stretch the Campsie Fells, on the top of which Crichton's Cairn was plainly discernible, and on the west the double summit of the Meikle Bin was in view. The varied colours of the mountain-pansy (*Viola lutea*), shading from pale yellow to deep purple, were specially remarkable on the hill-sides. *Antennaria dioica* was also seen here. The moor between this point and the Earl's Seat was literally covered with a species of Tipulidæ, which, on examination, proved to be *Tipula pruinosa*, W. The beautiful flowers of *Rubus Chamæmorus* were abundant on the moor, and on the top of Earl's Seat *Empetrum nigrum* was noted. From the summit (alt. 1894 feet) a magnificent view opened out. To the west lay Loch Lomond with its "fairy isles;" at our feet, looking north, were Ballikinrain and the Endrick Water; while beyond stretched an array of giant peaks of the Perthshire Highlands. Mr. John Smith contributed the following notes on the geological formation of the neighbourhood:—"Our immediate surroundings are of the most interesting description. During the glacial period the ice in the valley before us was more than 2000 feet thick; it passed down from the Highlands, over-rode the hills on which we stand, and has left along their brows a most

magnificent series of escarpments, rendered all the more prominent from the unequal hardness of the various rocks acted upon, and we can see the very gullies it made in finding its way over the brow of the hill into the heads of the Fin and Ballagan Glens. Stretching along the north-west front of the Fintry and Kilpatrick Hills, and sometimes detached from the hill-traps, are more than forty masses of felspar (the Dumbarton Castle Rock forming the last of the series in a south-west direction), and these masses now appearing along the north-west escarpment of the hills, as large, hard, intensely glaciated knobs, give to the locality its peculiar and interesting features. In our immediate neighbourhood are two very interesting glens on the north-west face of the range—the Easter and Wester Corries of Balglass. In the corries the hill-traps are seen to rest on a series of thin-bedded shales and rows of cement-stone nodules, giving a very peculiar and pleasing effect to the landscape. These beds appear to be lying almost horizontal, and are greyish in colour, a few of the bands being much lighter than the others, and one or two are of a light pinky red. They extend right through below the hills and out-crop again in the lower reaches of the Campsie, Fin and Ballagan Glens. This series of beds is not very fossiliferous, but in them have been detected a few plant remains, fish scales and worm tracks, which would seem to show that they were laid down in a fresh-water lake. They are computed to reach a thickness of close on one thousand feet, and the traps which overlie them are much about the same thickness, while the old red sandstone crops out from under them.” The return journey was made by Fin Glen, the sides of which are composed of boulder-clay and are cut into numerous gullies. Among the clay are to be found pieces of quartz which have been carried down from the Highlands. The burn has a fair volume of water, and in its course are two falls. In one of the corries near the head of the glen *Saxifraga hypnoides*, *Rubus saxatilis*, *Cystopteris fragilis*, *Polypodium Phegopteris* and *Lycopodium Selago* were noted. *Vaccinium Vitis-Idæa* was found blooming freely in the corrie west of Balglass. In Fin Glen goldilocks (*Ranunculus auricomus*) and the yellow mountain-saxifrage (*Saxifraga aizoides*) were seen. In a shady nook near one of the cascades the prickly shield-fern (*Aspidium aculeatum*) and the rather rare hairy rock-cress (*Arabis hirsuta*) were common. The

shining crane's-bill (*Geranium lucidum*), not a very common plant in Clydesdale, and the alternate-leaved golden saxifrage (*Chrysosplenium alternifolium*), which is abundant only in certain localities, both occur in the glen. Near the Earl's Seat the mountain hare (*Lepus timidus*) was seen, and at Campsie a squirrel (*Sciurus vulgaris*) was noted making its way from tree to tree.

Earl's Seat was visited a second time on 12th May, 1900, the ascent being made through Fin Glen and the return over the ridge of the Campsie Fells to the Campsie Road. Plants in bloom were not many, as the season was a late one. In the glen were noted the alternate-leaved golden saxifrage (*Chrysosplenium alternifolium*), the common species (*C. oppositifolium*) and the moschatel (*Adoxa Moschatellina*). The hart's-tongue fern (*Scolopendrium vulgare*) was growing on the rocks beside the fall, and in the stream near it abundance of the two water-mosses *Fontinalis antipyretica* and *Cinclidotus fontinaloides*—both barren. On the hill-side were the small selaginella (*S. spinosa*) and the moss *Amblystegium filicinum* (fertile), and on the moors the crowberry (*Empetrum nigrum*) and the red whortleberry (*Vaccinium Vitis-Idæa*). The following fungi were gathered:—*Agaricus disseminatus*, Fr.; *Polyporus brumalis*, Fr.; and *Peziza reticulosa*, Grev. One specimen of the "Daddy Long-legs," *Tipula vittata*, Mg., was captured in the glen. In the same place the ornithologists noted a pair of carrion crows (*Corvus corone*) and a pair of field-fares (*Turdus pilaris*) on the hill-side. Many white or mountain hares were seen near Earl's Seat.

Craigton Woods were visited on 12th October, 1889, under the leadership of the late Mr. Robert Turner, for the purpose of collecting fungi. The results are embodied in Mr. Johnstone's *Clydesdale Fungi*, (ante pp. 74-80). On Clober Moor *Hygrophorus russo-coriaceus*, B. and Müll., was got.

On 2nd July, 1891, a large party journeyed to Bearsden with the object of visiting Bardowie Loch, which had previously been visited on 9th April, 1887. The loch lies in a valley, and though not very large, presents a fair expanse of water. Its margins at intervals are well-wooded, and in the shallow waters bordering it is a profusion of aquatic plants. It is well-known to microscopists for the wealth of its minute animal and vegetable life.

Unfortunately for the party rain fell heavily, and put an effective stop to all scientific work.

The Linn of Baldernock was visited on the 19th of August, 1899, but the report gives us nothing noteworthy. Garrel Glen, Kilsyth, has been twice visited, 3rd September, 1887, and 6th August, 1892, but neither occasion has yielded any results or records.

On 15th October, under the leadership of the late Professor Thomas King, Mugdock Castle Wood was the scene of the fungus foray of 1892, a large party of members of this Society, in conjunction with the Natural History Society of Glasgow, taking part in the excursion. Forty-one species of fungi were noted. Among the rarest were *Agaricus fragrans*, Sow., *A. polygrammus*, Bull., *A. nidorosus*, Fr., *Cortinarius sanguineus*, Fr., *Hydnum repandum*, L., *Lactarius glyciosmus*, Fr., *L. quietus*, Fr., *Polyporus sanguinolentus*, Fr., and *Tremella foliacea*, Pers.

Excursions were made to the Meikle Bin, the highest point of the Kilsyth range of the Campsies, on two occasions, 12th May, 1894, and 20th August, 1898. At the former of these the ascent of the Fells was made from the village of Milton by a large party. The route taken was along the course of the little stream behind the village, and a halt was made at a large waterfall near the top of the first ridge. The mossy saxifrage (*Saxifraga hypnoides*) was observed growing in abundance here, while the hill-sides were covered with the mountain-pansy (*Viola lutea*). Crossing the moor the marsh-violet (*Viola palustris*), and the cloudberry (*Rubus Chamæmorus*), were noted. To the north-west of the Reservoir the rounded double cone of the Meikle Bin came into view. On gaining the summit (alt. 1870 feet) the labours of the ascent were amply repaid. As extensive, varied and picturesque a scene as there is in Scotland opened itself out. Away to the north, north-west and west a panorama of bold rugged Highland hills, some of which still bore traces of the late snows, stood out against the sky. Among the more notable peaks were Ben Ledi, Stuc-a-chroin, Ben Voirlich, Ben Venue, Ben Aan, Ben More, Ben Lomond and Ben Cruachan. Towards the north-east and east lay the Lomond and Pentland Hills, and the Firth of Forth, with the towns bordering on its shores, was clearly distinguishable, while, with the aid of a binocular, the Forth Bridge came into view.

Abbey Craig, with the Wallace Monument, appeared at no great distance, and peering over a ridge was the top of Stirling Castle. Northward the river Carron skirted the base of the hills. Descending by the Reservoir, about which the cloudberry was blooming abundantly, the party split, some making for Gavell, some for Kilsyth and others for Kirkintilloch by way of Cass Glen. At the foot of Corrieburn, a hawthorn was measured girthing 4 feet 10½ inches at 3 feet 6 inches from the ground, on the north side. The ornithologists noted thirty-six species of birds. Among these were the tree-pipit (*Anthus trivialis*), heard above Milton; the common white-throat (*Sylvia cinerea*), heard in two places near Kirkintilloch, making the first record for the season; the corn-bunting (*Emberiza miliaria*), a pair seen; the common sandpiper (*Totanus hypoleucus*), and a pair of lesser black-backed gulls (*Larus fuscus*). At the Dam were some dunlins (*Tringa alpina*), and a golden plover's (*Charadrius pluvialis*) nest with four eggs was seen. At the excursion in 1898 the attempt to reach the summit had to be abandoned on account of a dense mist which prevailed.

Corrieburn was visited on the 9th June, 1894. The party detrained at Milton and passed through the village eastwards towards Antermoney Loch. The hop (*Humulus Lupulus*), a plant not very frequent in Clydesdale, was observed trailing over the hedges surrounding one of the village gardens. When Antermoney Loch was reached a beautiful sight presented itself to the party. The banks of a little burn issuing from the loch were thickly clad with the heart-leaved valerian (*Valeriana pyrenaica*) in full bloom. This plant is comparatively rare in Clydesdale, but at this spot it was growing in profusion, and more luxuriantly than in any other station noted by the Society. Further on, at an old bridge on the road-side, the hairy rock-cress (*Arabis hirsuta*) was found. On reaching Corrieburn the bed of the stream was followed as far as the entrance to an old mine. Here the party spent some time searching for iron-stone nodules, in the hope of finding some containing fossils. Botanically the burn was very barren, a few common hawkweeds and milkwort (*Polygala vulgaris*), with its red, blue and white flowers, being all that were observed. The homeward journey was made by way of Gavell.

On the 29th June, 1889, a small party joined with the Scottish Natural History Club of Edinburgh in an excursion to the

Carron. The stream was struck about a mile above Denny, and both banks were botanised. The glen presents, in its surface aspect, and particularly in the bed of the stream, features which contrast strongly and in many ways with the west country glens with which our members are so familiar. The part visited is a pure mountain stream flowing through a valley presenting an agreeable variety of contour, emphasised by being well-wooded on the north bank, while the south consists of steep, sloping, wet meadow-land. Near the top of the wooded portion of the glen and in the bed of the stream, some very interesting geological phenomena are seen. At this point the river seems to cross the "neck" of an old volcanic orifice, the rock being apparently a volcanic breccia or agglomerate consisting of angular blocks of varying shapes and sizes, which have been discharged from the volcano, and having fallen back into the pasty material in the crater have there consolidated. Such a rock-formation will easily lend itself to the making of depressions, each of which will become the centre for the forming of a pot-hole. The grinding on the sides of the depression will be carried on, not only by stones brought down by the stream as is usual, but will be accelerated by the dislodging of the angular blocks. The result is, that at this point, the river is quickly eating its way down through the stratum in a series of pot-holes. Among the number of interesting plants noted were:—*Mimulus luteus*, *Melica nutans*, *Bromus asper*, *Milium effusum*, *Asplenium Ruta-muraria*, *Peucedanum Ostruthium*, *Alchemilla montana*, *Artemesia vulgaris*, *Circea lutetiana*, *Geranium sylvaticum*, *Habenaria albida*, *H. chlorantha*, *Triglochin palustre*, and *Viburnum Opulus*. The great display of foxglove (*Digitalis purpurea*) on the left bank of the stream is worthy of mention. There must have been thousands of plants, all in beautiful bloom, and, as they were on the steep bank, the effect was most striking, even at a considerable distance.

Larbert was the point of departure on 21st June, 1890, for the purpose of visiting Denny and the Carron. On detraining a slight detour was made for the purpose of viewing more closely the elegant and finely situated parish church of Larbert. The churchyard contains the burial-place of the Bruces of Kinnaird, and in it lie the remains of the most illustrious member of the family, James Bruce, the African traveller—"Abyssinian Bruce."

Proceeding on the road to Denny, the configuration of the country attracted the attention of the geologists. The valley through which the Carron here flows is notable for an interesting series of mounds of post-glacial gravel (frequently flat-topped) called kames—some elongated, some sow-backed, and others spherical, like the one in Dunipace grounds which the party visited *en route*. After crossing the Carron one of the kames was seen in section from the top of the mound to the level of the valley, giving an opportunity for observing the material—sand and gravel—of which such mounds are composed. Here also was found on the walls by the road-side, and in the greatest profusion, the wall-rue spleenwort (*Asplenium Ruta-muraria*), a fern not found abundantly in Clydesdale. On reaching Denny the river was followed for about three miles, and, in addition to the plants already recorded, the butterfly-orchis (*Habenaria bifolia*), the early purple orchid (*Orchis mascula*), the marsh-orchid (*O. latifolia*), and the spotted palmate orchid (*O. maculata*) were noted. Many species of fern were seen, among them being the maiden-hair spleenwort (*Asplenium Trichomanes*), the oak (*Polypodium Dryopteris*), the brittle-bladder (*Cystopteris fragilis*), the shield (*Aspidium aculeatum*), and the heath-shield (*Lastrea Oreopteris*). One grass which is very rare in Clydesdale, the downy oat-grass (*Avena pubescens*), was also found. The return journey to Denny was made by road, and the party proceeded thence by Dennyloanhead to Greenhill. The heart-leaved valerian (*Valeriana pyrenaica*) was noted at Greenhill, and on the canal bank “codlins and cream” (*Epilobium hirsutum*). Near the Carron the following fungi were collected:—*Agaricus mutabilis*, Schæff., *A. campestris*, Linn., *A. dryophyllus*, Bull., *A. fascicularis*, Huds., *A. semiglobatus*, Batsch., and *Coprinus atramentarius*, Fr.

The district about Castlecary was visited again on the 22nd August, 1891, when Castle Rankine Glen was the rendezvous. The steep banks of the glen are thickly wooded, the trees consisting chiefly of ash, alder, great maple, hazel and rowan. On account of the lateness of the season the botanical record for the afternoon was meagre. In the glen were noted *Cystopteris fragilis* and *Asplenium Trichomanes*. At two stations by the road-side masterwort (*Peucedanum Ostruthium*), an umbellifer not

common in our district, and, in the Forth and Clyde Canal (at the station recorded in Henny's *Clydesdale Flora*), the common arrow-head (*Sagittaria Sagittifolia*) were observed. Among the birds noted by the ornithologists was the wood-wren (*Phylloscopus sibilatrix*). The yellow-hammer (*Emberiza citrinella*) was still in full song, and, in evidence of the late breeding of this species, young birds were seen and a parent catering for them. The following is a list of the lepidoptera netted by the entomologists:—*Tapinostola fulva*, Hb., *Celaena Hawthornii*, Curt., *Noctua glareosa*, E., *N. Xanthographa*, W. V., *Xanthia flavago*, Fab., *Polia chi*, L., *Crocallis elinguaris*, L., *Larentia didymata*, L., *Ypsipetes sordidata*, *Melanippe fluctuata*, L., *Cidaria inmanata*, Haw., *C. testata*, L., *C. populata*, Bork., and *C. fulvata*, Forst.

Bonnybridge was visited on the 13th June, 1891. From the railway station the route taken was in an easterly direction to Bonnymuir Wood, where the party inspected an interesting portion of the Roman Wall. This—the wall of Antonine—was built in A.D. 139, and stretched for almost 37 miles between the Firths of Forth and Clyde. It consisted of a vallum or wall built of regularly laid sods on a stone foundation, a fosse or ditch of great depth and breadth along the north side, and, on the south side, a paved military road for easy communication between the various forts. At Bonnymuir Wood sections of the wall have been made under the supervision of the Archaeological Society of Glasgow. These sections, cutting the wall transversely, expose *in situ* the stone foundations or causeway upon which the turf wall was built. At one point of the line a part of the vallum has been restored. Working on the foundation, which is about 14 feet in breadth, the wall has been raised to what has been conjectured to be the original height, the ditch cleaned out and a gutter of small stones laid. The sections and the restoration were examined with great interest. Leaving the wood the party proceeded towards the village of Bonnybridge, thence the route lay along the banks of the Forth and Clyde Canal to Castlecary. The principal plants gathered were *Lychnis vespertina*, *Arenaria serpyllifolia*, *Cardamine amara*, *Lysimachia nemorum*, *Stellaria uliginosa*, *Menyanthes trifoliata*, *Carex curta*, and *C. ampullacea*. A number of less common plants, not in flower, were also seen, notably *Sium*

latifolium (which is very rare in Scotland and was discovered at this station by Mr. Johnston Shearer in 1889), *Lycopus europæus*, and *Lysimachia thyrsiflora*. A large colony of house-martins (*Chelidon urbica*) was noted at the railway viaduct over the Red Burn at Castlecary. The nests were built under the coping stones of the bridge, but this proximity to the line, and the rumbling of the passing trains, did not seem to disturb the busy birds in the least. In Bonnymuir Wood a hedge-hog (*Erinaceus europæus*) in its nest was found.

On 29th April, 1893, Dullatar, in the outlying portion of Dumbarton bordering on Stirlingshire, formed the point of departure for an excursion to Cumbernauld estate by way of Castlecary Glen. From the station the route for some distance lay along the line of the Roman Wall, the fosse of which is easily traceable, as far as it was followed by the party. The marshy portion of the ditch was crowded with the beautiful yellow clusters of the marsh-marigold (*Caltha palustris*), while the lady's-smock (*Cardamine pratensis*) and the water starwort (*Callitriche verna*) were very abundant. Westerwood Farm, not far from the wall, was pointed out as the site of one of four Roman forts, traces of which have been found in the neighbourhood. Castlecary Glen was entered near the Red Burn, at a point where lie the ruins of an old chapel supposed to have been erected by the Culdees. A white beam tree (*Pyrus Aria*) was measured here, and girthed $7\frac{1}{2}$ feet at 2 feet 8 inches south. The early flowering of our common woodland plants was evidenced in every part of the glen; not for many years had vegetation been so far advanced. The wild hyacinth (*Scilla nutans*), red campion (*Lychnis diurna*), the greater stitchwort (*Stellaria Holostea*), sweet cicely (*Myrrhis odorata*), beaked parsley (*Anthriscus sylvestris*), wood-anemone (*Anemone nemorosa*), wood-sorrel (*Oxalis Acetosella*) and the marsh-violet (*Viola palustris*) were all in full bloom. The small hairy woodrush (*Luzula pilosa*) was exceedingly common, while the great hairy woodrush (*L. sylvatica*) was met with along the stream. Of the lesser trees the gean (*Prunus Avium*) was most conspicuous, being loaded with blossom. The hag-berry (*Prunus Padus*) and the sloe (*P. spinosa*) had also a plentiful show of flowers. On leaving Castlecary Glen the route was retraced along the railway embankment towards Cumbernauld Glen. The orpine

(*Sedum Telephium*) and a few plants of columbine (*Aquilegia vulgaris*), evidently garden escapes, were noted on the side of the line. The scarlet elder (*Sambucus racemosus*) was the only plant which attracted any attention in the glen. Near Cumbernauld House a large bed of *Arum maculatum* was seen, and close beside it the hop (*Humulus Lupulus*) had been carefully trained. The attention of the party was turned chiefly to the trees of the estate, and a number were measured. In the Mains Park a wych-elm (*Ulmus montana*) girthed 7 feet 6 inches at 2 feet 3 inches north. This was one of the two trees planted in the kitchen-garden of the old castle, which was burnt to the ground by a party of Highlanders during the Rebellion of 1715. Outside this park a horse-chestnut (*Æsculus hippocastanum*) measured 11 feet 4 inches at 2 feet 8 inches south. In the Home park, north of the garden-wall, another wych-elm girthed 12 feet 7½ inches at 3 feet 3 inches south-west; a great maple (*Acer pseudo-platanus*) near measured 12 feet 7½ inches at 4 feet 9 inches north, and a beech (*Fagus sylvatica*), opposite the Bowling Green, was 14 feet 3 inches in circumference at 5 feet 1 inch south. Mr. John Boyd, who acted as conductor, had measured this tree in December, 1889, when its girth was 14 feet at 5 feet south, and 15 feet 4 inches at 3 feet. In Bell's Bank Park, on the other side of the stream, a beech girthed 14 feet 2½ inches at 4 feet 9 inches west. On the north of the glen drive, the "Lover's Oak," a tree said to have been used as a letter-box by one of the daughters of the house, measured 10 feet 9 inches at 2 feet 6 inches north. A yew tree (*Taxus bacatta*), north of the house, was 6 feet 11 inches in circumference at 2 feet 6 inches west. Two larches (*Larix europæa*), which are said to have been planted among the earliest in Scotland, measured respectively, 7 feet 8 inches at 3 feet 2 inches north, and 9 feet 10 inches at 3 feet south. Probably the soil and exposure account for their slow growth. In the same park a Spanish chestnut (*Castanea vulgaris*) girthed 13 feet 11½ inches at 1 foot 6 inches north, whilst a walnut (*Juglans regia*) east of the house girthed 10 feet 6½ inches at 2 feet 5 inches north. To the south of the house a Spanish chestnut measured 14 feet 4 inches at 2 feet 8 inches west, and in the avenue near the lodge a beech on the south side girthed 11 feet 6½ inches at 4 feet 1 inch west, while one close to the wall was

11 feet 4 inches at 3 feet east. After leaving the estate a number of the party visited the "Standing Stone of Carrick," a Roman altar similar to others found in the country, but with neither carving nor inscription.

Stirling, so graphically described in the first volume of the *Annals* (1893, pp. 66-70) of the Society, was visited on the 8th July, 1893. The company was unfortunate in the matter of weather, as rain prevailed all afternoon. The Smith Institute, with its valuable collection of historic relics and objects of natural science, was first inspected, and afterwards the curator kindly showed the party over his garden, which contained many fine herbaceous plants, both native and foreign. In a downpour of rain the way up the Back Walk was taken, and the circuit of the Castle Rock was made. The list of plants observed is small compared with what it might have been in more favourable circumstances. Among the rarest were Alexanders (*Smyrniolum Olusatrum*), the small convolvulus (*Convolvulus arvensis*), the deadly nightshade (*Atropa Belladonna*), the welshed-thistle (*Carduus tenuiflorus*), the lettuce (*Lactuca virosa*), the white dead-nettle (*Lamium album*), the dyer's-weed (*Reseda Luteola*), the hemlock (*Conium maculatum*), the Burnet saxifrage (*Pimpinella Saxifraga*), the white mullein (*Verbascum Lychnitis*), the glaucous rush (*Juncus glaucus*), and the golden oat-grass (*Trisetum flavescens*).

Stirling was again visited on the 7th August, 1897. From the station the party proceeded by car to Causeyhead, and thence skirted the base of Abbey Craig. A halt was made at the old church of Blair Logie, a building erected in 1598, and now in ruins. Nestling at the base of lofty cliffs it occupies a beautiful situation, and, with a thick mantle of ivy covering its old walls, presents a charming picture. Near the churchyard gate a luxuriant bed of Good King Henry (*Chenopodium Bonus-Henricus*) was seen. The Sheriffmuir Road was taken from this point, and, after a moderate walk, the summit of Dumyat was gained. The only plant worth mentioning while crossing the moor, preceding the ascent, was the rough marsh bedstraw (*Galium uliginosum*), which occurred in great abundance. From the peak (1375 feet), a magnificent view was obtained. For interest and extent the scene cannot be surpassed, and will be hard to parallel in Scotland. The course of the River Forth, with its serpentine windings and links, could

be followed through the vale of Menteith, almost from its source in the west to where it widened out into the majestic firth in the east. Northwards lay the historic field of Sheriffmuir, where the Highland clans fought on behalf of the ill-fated Stuarts. Beyond, and stretching round to the west, were the peaks of the Grampians, among whose summits Ben Lawers, Stuc-a-chroin, Ben Voirlich, Ben Ledi, Ben More, Ben Venue, Ben Narnain, Ben Arthur and Ben Lomond were recognised. The descent was made on the Menstrie side, and near the foot of the hill, rest-harrow (*Ononis arvensis*) and shepherd's-club (*Verbascum Thapsus*) were observed. On reaching Stirling time only permitted a hurried visit to the Lady's Rock.

On 6th August, 1890, a large party visited the estate of Keir. Detraining at Bridge of Allan, the grounds were approached by the Lime Tree Avenue, and the site of the ancient church of Lecropt and the churchyard were first inspected. The late laird, Sir William Stirling-Maxwell, Bart., took great interest in the churchyard, but, since his time, it has been left to nature. The yew trees here are particularly fine, some attaining a height of at least twenty feet. With the exception of the quaint arrangement of the path into the form of a Latin cross, however, the place was in a considerable state of neglect. Keir House possesses many attractions. Inside it bears all the marks of the taste of its late proprietor. The rooms are filled with curios and artistic furniture of great value. The library, beautifully decorated, contains a valuable collection of books selected with the greatest care. Among the treasures of the house are many fine paintings, with several examples of the old masters. At the entrance to the gardens, the party was taken in charge by the head gardener, Mr. Thomas Lunt, who conducted them through the pinetum, gardens and glass-houses. Attention was principally directed to the trees, of which Mr. Lunt had an extensive and accurate knowledge, and the following notes and measurements were made. To the west of the house is a very fine Spanish chestnut (*Castanea vulgaris*) of great age, but still vigorous, which girthed 20 feet 9½ inches at 3 feet from the ground. This side of the house has *Cupressus sempervirens* planted against its walls up which the trees have grown to the height of the third storey, giving the whole a very unusual appearance. The large *Araucaria imbricata*, for which Keir has

been so long famed, was, at the time of the visit, unfortunately decaying rapidly. It had been blown over in December, 1879, and, although set up again, it had not shown signs of making a fresh start into growth. It measured, when blown over, 44 feet in height, and girthed 4 feet 4 inches at 6 feet from the ground. A larch (*Larix europæa*), large, but not very well proportioned, is said to have been amongst the first of its kind planted in Scotland, possibly about the year 1738. Its girth is 12 feet 2½ inches at 4½ feet up. The largest silver fir (*Picea pectinata*) measures 9 feet 2 inches at 5 feet, and is a very good specimen; of the Scots fir (*Pinus sylvestris*) in the grounds the most notable girthed 9 feet 3 inches at 5 feet up. *Cedrus deodara* has been extensively planted, and many fine specimens were seen. *Wellingtonia gigantea* has been planted in suitable positions, but none of the trees is of large size yet, though they are quite vigorous and healthy. Fine specimens of the following were measured:—*Cryptomeria japonica*, girth 6 feet 5 inches at 4 feet from the ground; *Pinus insignis*, girth 8 feet 11½ inches at 4½ feet up; *Abies Menziesi*, girth 7 feet 2 inches at 4 feet up; *A. Douglassi*, girth 9 feet 11½ inches at 5 feet up; and *A. morinda*, girth 5 feet 9½ inches at 3½ feet up. For the district there is also a particularly good specimen of *A. Webbiana*. Only rarely is a good example seen except near the coast, as it is a pine that is apt to be injured by spring frosts. It is the finest of all the silver firs cultivated in this country, and this example girthed 5 feet 2 inches at 4½ feet up. Many other different species of pines in splendid condition were noted. The general arrangement of the grounds surrounding the house, with its terraces, ferneries and statuary, was very striking, and mention may be made particularly of the Bowling Green with its quaintly shaped hedges and shrubs.

Buchanan Castle and Balmaha, described in the first volume of our *Annals* (1893, pp. 60-62), again saw the Society on 27th August, 1898. Under the guidance of the head gardener, Mr. Crosbie, the extensive range of glass-houses which contain many interesting and beautiful plants, including palms, grevilleas and orchids, was inspected. One of the houses contained a mango tree which was growing too tall for its abode. It had been raised from one of two seeds brought home by the Duke of Montrose since the last visit of the Society. Many of our native

ferns were growing in one part of the gardens where a small rockery is built about a rustic well. Noticeable among these were some magnificent royal ferns (*Osmunda regalis*). The most remarkable plant was, however, the famous Buchanan fern (*Asplenium Filix-fœmina*, var. *Victoriæ*). This peculiar fern has a cruciate form with narrow pinnae, forming a number of square openings. It was discovered in 1861, not far from the castle, by Mr. J. Cosh. Mr. Crosbie says that since its discovery it has been propagated by spores, and the varietal form has remained true. From Balmaha, to which the party proceeded after leaving the castle grounds, boat was taken to Inchcalliach. The ancient burial-place was visited, and excavations were found to have been begun, evidently for the purpose of laying bare the walls of the old church or nunnery.

On the 26th August, 1899, the Society visited Loch Lomondside again, proceeding from Rowardennan towards Balmaha. The road was soon abandoned for the superior attractions of the shore, where the presence of the very rare lesser skull-cap (*Scutellaria minor*) excited surprise by its extreme luxuriance. The common skull-cap (*S. galericulata*) was also present in profusion, but could not be compared with its smaller congener whose pretty pink blossoms made the stony corners, which are its habitat, "to blossom as the rose." Here also the gipsy-wort (*Lycopus europæus*) and tutsan (*Hypericum Androsæmum*) were seen. The great fault, forming the boundary between the Highland Silurian schists which extend northwards and the old red and calciferous sandstones which run southwards, was crossed hereabouts. As time pressed the road was again sought by cutting over Ross Point. To gain this was a matter of some difficulty owing to the luxuriant growth of heather and bracken and the wooded nature of the ground. From the Dubh Loch, where the road was struck, a pleasant walk brought the party to the Pass of Balmaha. Near this the hillock of jasper—an inconspicuous green mound—might have remained unnoticed, but for a heap of stones on the roadway which attracted attention to its vicinity, and from which several good specimens were got. The only notable bird seen was a capercailzie (*Tetrao urogallus*), which flew out from the rocks at Ross Point.

XV.

THE NATURAL HISTORY OF AILSA CRAIG.

BY JOHN SMITH, JOHN PATERSON, AND HUGH BOYD WATT.

THIS account of the natural history of Ailsa Craig is based upon contributions made to the Proceedings of our Society (as detailed in Appendix A), and upon observations and experiences of the writers. Mr. Smith is the author of the sections upon Geology and Phanerogams, Mr. Paterson of that upon Birds, and Mr. Watt is responsible for the other subjects, in some of which, particularly with the Invertebrates and Diatoms, he is entirely indebted to the gentlemen named as authorities for the lists. Mr. Watt takes this opportunity of thanking all who have assisted with this monograph; and he believes that, taken along with the information contained in the annotated references named in Appendix B, the reader has now placed at his disposal practically all that is known about the natural history of Ailsa. References are made to the Appendices in an abbreviated form;—thus A.I is a reference to the first entry in Appendix A, and B.I, 10 is a reference to page 10 of the first work mentioned in Appendix B.

PHYSIOGRAPHY.

GEOGRAPHY AND TOPOGRAPHY.—Ailsa is situated in latitude $55^{\circ} 15'$ N. and longitude $5^{\circ} 6'$ W., and measures, according to the Ordnance Survey, 3900 feet in length, 2600 feet in breadth, and 1114 feet in height. According to the current Admiralty Chart the height, however, is only 1097 feet. It has an area of 220 acres, and in circumference is rather more than $2\frac{1}{4}$ miles; the tide rising and covering the rough rocky shore, makes a circuit of the island on foot possible only about low water. Girvan is the nearest port, $9\frac{1}{2}$ miles distant, and Ardwell Point, Ayrshire, the nearest land, $8\frac{1}{2}$ miles away. It is in the barony of Knockgarron

(the property of the Marquis of Ailsa), and contained in the inland parish of Dailly. It stands on the narrowest part of the wide submarine ridge known as the Clyde Barrier Plateau, which extends between the coasts of Kintyre and Ayrshire. This plateau covers about 313 square miles, having an average depth of water upon it of about 24 fathoms. To the north and south is deeper water, and thus an elevation of the land of about 150 feet would transform Ailsa into an isolated rock-hill of the mainland, having a large land-locked loch northwards of it and the sea southwards.

The addition of the word Craig to the name is a piece of modern tautology, probably due to Burns. At least I have found no earlier mention of the name Ailsa Craig than the poet's line "Meg was deaf as Ailsa Craig," all earlier writers and many later ones using the simpler form Ailsa in various spellings. Thus in a charter of 1404 it is "Insula de Ailsay," Dean Monro in 1549 writes Elsay, and Bishop Leslie in 1578 Elissa and Elza. Mr. Smith observes that old people never say Ailsa Craig, they always call it Yelsa. Like many of our western isles' place-names it is a compound of Gaelic and Norse, and is from G. *aill* or *alt* = cliff or height and N. *ay*, *a* = an island; a correct description. Besides the languages named the contemporary speech of the country is represented in Ailsa place-names, some of which are of so recent an origin as to date only from the establishment of the Lighthouse (1885-6). These convey their own meanings; but of the older names this cannot be said, and any renderings of them partake too largely of conjecture to be discussed here. Generally speaking it is somewhat surprising to find so many place-names on this small and rough island.

METEOROLOGY—In the last published "Returns from Scottish Lighthouses for 1897 and 1898,"¹ the Ailsa results for the two years named are as follows:—

(Height sixty feet.)	1897.	1898.
Average mean temperature - - -	49°0	50°3
Barometer—Average mean at 32° - - -	29·829	29·844
Rainfall in inches - - - -	16·71	20·84

The rainfall for these two years at Queen's Park, Glasgow (alt. 145 feet) was 40·22 and 38·44 inches respectively.

¹ *Journal of the Scottish Meteorological Society*, 3rd Series, Vol. XI., Nos. 13-15. Edin., 1900.

GEOLOGY.—The form of Ailsa, at least in profile, is well-known, and is concisely expressed in Keats's "Craggy ocean pyramid," with "two dead eternities—the last in air, the former in the deep." Its ground-plan cannot be so well made out by the eye, but the Ordnance Surveyors have shown us that it is somewhat oblong, the long axis being north and south. At the time Ailsa assumed about its present orographical position it was probably nearly circular in plan, but the waves have so nibbled at it, especially on the west and south coasts, as to reduce the original sub-circular to the present form, and this dissection has been of the greatest value to the geologist in bringing out to a large extent its remarkable geological structure. Prof. James Geikie, in his short description of Ailsa, printed in the Rev. R. Lawson's book (B. XV. 68), says that the rock probably rises from Silurian strata, but I think that this is in the highest degree unlikely, and for the following reason. If we extend the line of the great boundary-fault—a "hitch" which separates geologically the southern uplands of Scotland from the lowlands and is thought to have a throw of some twelve thousand (12,000) feet—we will find that Ailsa is situated seven miles north-west of that line, and the only logical conclusion which we can draw from this fact is that it rises from old red sandstone strata. Then as to what Ailsa rock really is (considered as a part or "formation," of the earth's crust) is another question fraught with difficulties. (1) It may be part of the infilled pipe of an old volcano; or (2) it may be sedimentary rock metamorphosed in position; or (3) it may be the remnant of an immense sill or lacolite. The first is the favourite theory with geologists, but there are serious objections to it, the most serious being the columnar structure which is nearly vertical, this feature having been well dissected out by the waves on the south and west sides of the island. It is an axiom in geology, well sustained by nearly every writer on the subject, that columns in igneous rocks stand at right angles to the cooling surface, so that, if Ailsa represents a remnant of a filled-up pipe of a volcano, it is but reasonable to expect that the columns would be lying in a horizontal manner. As to the second point, the theory of igneous rocks having been metamorphosed from sedimentary ones finds favour with many geologists, but here there are no data to support it. The third theory answers best to the

facts of the case, but a sill or lacolite at least 1100 feet thick is apt to stagger the most *blasé* geologist, but, of course, it may not all have taken place at one injection, and I shall now proceed to consider the facts in support of this theory. There are the columns which form a strong buttress to the theory, and a large part of the northern half of the west coast shows very decided lines, dipping gently to the north, which may be partings between small sills injected at different times, or they may represent the successive cooling of larger sills, so that the sill or lacolite theory, is the one most strongly supported by the geological features of the island. I may here remark that there is a considerable resemblance between this structure of the Ailsa syenite and the slabby structure so well seen in many parts of the Arran granite. Ailsa rock or syenite exhibits a variety of structures and colours or shades. Thin plates of it prepared for the microscope show that it contains all the constituents of a typical granite, and it has in consequence been called micro-granite. It contains a rare mineral (abundant here) once thought to be a variety of hornblende. This mineral has been called riebeckite, and is in largest crystals—up to a quarter of an inch long, and of a dark-green colour—where the rock assumes its finest columnar form. The columns of syenite about the middle part of the west coast show what appears to be a remarkable style of veining or jointing; this cannot be examined closely, but from the columns being very irregularly divided into “compartments” it gives to them a strange appearance, and one I have not seen elsewhere. These columns may have been weathering since raised-beach times. Besides the magnificent columnar structure so well seen at the south end and on the west side, the columns being of considerable width and reaching to perhaps 300 feet high, there is a platy structure well displayed in a small area on the south-west coast, the plates dipping gently to the water. A similar structure (but much weathered) is also seen near the summit of the island, and here it is not far from being horizontal. The sill or slab-like structure of the north-middle part of the west cliffs has already been referred to. At the north-west, north, and north-east sides weathering has also brought out a structure which when viewed from a short distance gives to the syenite a stratified-looking appearance. This structure trends in a north-north-west and south-south-east direction, and is more

or less perpendicular, and where it is seen the columnar structure disappears and the rock is much finer grained, the blocks which have fallen from the cliffs of this structure on the north-west side being the largest on the shore. It is from this part that the curling-stone maker selects his material, which he calls the "blue-hone" and the "red-hone," although the blue is not very blue, nor the red one very red. There are other two varieties called "pepper and salt" and "Ballochmyle." There is, however, a pretty red variety of the syenite to be obtained, and it appears to be a result of what I might call extra-contact metamorphism. This will require a short explanation. Passing through the syenite in an N.N.W. and S.S.E. direction there are a number of respectable, but not great-sized, dolerite dykes, some of them at parts amygdaloidal, and it looks as if the structure described above with its N.N.W. and S.S.E. trend (which may be owing to crystalline orientation, or perhaps to pressure as I suggested in 1893 when I wrote a short description of the island—it may of course be rhyolitic) may have had something to do in determining the trend of the dykes. One of these dykes occurs about 100 yards N.E. of the south horn building. For eight feet from the side of the dyke the syenite is of the usual greyish, green-tinted variety (a shade greener than usual, at least close on the dyke), then there are three feet of the reddest stone on the island shading away outwards for a few feet until the usual colour of the rock at this part is reached. The dykes are all much of the same quality of dolerite, not a very fine grained variety except where in contact with the syenite, where the dolerite is often much jointed. They are mostly prismatic across, but the prisms are not at all clean-cut. In some of the dykes there are vertical lines which divide them into several parts, generally three (and the line of a dyke is often seen to "gink"). This is probably the result of cooling, at least there is no apparent change in the material to show that there had been several injections. The dykes closely resemble in mineral structure many of those which cut through various strata in the west of Scotland, and are probably of Tertiary age. As to the age of the syenite, it must of course be older than the dykes, and younger than the rock from which it rises—which I have already shown is probably old red sandstone. I am not aware that the drift period is materially represented on Ailsa, at least I saw no boulder-clay,

nor boulders foreign to the island, nor am I acquainted with any records of any ;¹ but the well-known caligraphy of that period can still be distinctly traced on the east face of the rock, the glacial striæ running in a horizontal direction along the smoothed and ice-worn surface of the syenite, and reaching to perhaps 500 feet above sea-level ; the upper half of the surface of the Craig being much more broken up by weathering than the lower. During the glacial period Ailsa syenite has been dispersed to considerable distances, and it is found in the Isle of Man. The raised-beach period is well represented on the east side by the great bank of very coarse shingle composed of syenite blocks and pebbles, with a few of dolerite from the dykes, and by some old caves at the north end. These caves are mostly in the lines of trap-dykes, but the Water Cave has been excavated in the solid syenite. The material composing this great bank of shingle cannot have been derived from the east side of the island, as the old sea-cliffs there are but feebly, or not at all, represented, and it has evidently been brought mostly from the south, partly from the north end, and as many of the blocks are over one foot in diameter this gives us some notion of the turmoil which must take place during storms. A number of years ago an immense fall of rock occurred at the south end during a thunder storm. This must have often taken place on Ailsa, and will continue to do so till the whole island has fallen into the sea, the rock being ground up by the ocean-mill into pebbles, sand and mud, and carried off by the currents. The high cliffs on the west and south sides were probably, in great part, produced by the waves during raised-beach times, but the beaches or rock-beaches themselves have now been obliterated. The west cliff is said to reach to about 300 feet in height, and in that respect closely resembles the great raised-beach cliff at Goldenberry Head near Portincross, and gives us a vivid idea of the immensely long period of raised-beach time. The raised-beaches of both Wigtownshire and Ayrshire contain plenty of Ailsa syenite pebbles, and they are often to be seen on the present shores of the mainland.

The deposits in Garry Loch are known to be 17 feet deep, and it would be interesting to ascertain if this hollow had been excavated in the rock or the loch merely formed by a detrital dam.

¹ See, however, B. XVI. 154, where Mr. MacCartney gives a description of a deposit of boulder-clay which he found (Ed.)

VERTEBRATA.

MAMMALIA.—A “screw-mouse” seems to be pretty well-known on Ailsa, but not having obtained a specimen we cannot say whether it is *Sorex vulgaris* or *S. minutus*. Badgers (*Meles taxus*) to the number of five were put upon the island about the year 1876, and the introduction was so far successful that young ones were subsequently seen,¹ but none at all have been observed for several years now. Another name for the Water Cave is the Mermaid’s Cave, said to be so-called after the seals (doubtless *Phoca vitulina*) which frequented it, and which still occur (B. XV. 60). There is no recollection of any stranded cetacean, but “whales” are sometimes seen, and Mr. A. Girvan says that in his frequent passages between Girvan and Ailsa he often observes “buckers,” so well-known in Clyde waters (? the white-beaked dolphin, *Lagenorhynchus albirostris*). A porpoise (*Phocæna communis*) was seen by us off the Lighthouse on our last visit. The brown rat (*Mus decumanus*) unfortunately gained a footing in 1889 (B. VII.) and, although killed in great numbers, still flourishes. They are hard upon the young birds, and the tacksman says that last year (1899) he scarcely saw a young puffin, as the rats killed them all; they clear off the dead bodies of the birds which used to lie at the base of the cliffs in heaps, those bodies now disappearing far more quickly than they did from natural causes. Rabbits (*Lepus cuniculus*) were seen by our party, and these have been long known here, as John Monipennie, writing about 1597, says of “Ailsay” . . . “there are many conies and solayne geese in it” (B. XX. 175). Another introduced species, the goat, has inhabited the island for long and breeds freely, as we saw several kids. The herd apparently numbers about fifty, and although roaming at large the animals cannot be called wild. At the same time as the badger experiment, racoons (? species) were also put upon the island, and seem to have survived longer than the badgers, as one was noticed within the last few years by Mr. W. A. Tulloch of the Lighthouse, who also tells us that he has seen a dead mole and young hare on Ailsa. These were, no doubt, carried over by birds as prey from the mainland.

¹J. A. Harvie-Brown’s *Rarer Animals of Scotland* (1882), p. 39.

AVES.—Many species of birds find a home on Ailsa Craig, but it is not proposed here to give an exhaustive list of those that are resident or nest there, or such as have been recorded as occurring as transient visitors only. It is still frequented by the peregrine falcon (*Falco peregrinus*) and raven (*Corvus corax*), which continue to breed, but the sea-eagle (*Haliaëtus albicilla*) has not been known to nest there for many years. Not a few land birds, such as the blackbird, wren, hedge-sparrow and wheatear, are pretty common, and rock-pipits are very conspicuous, but its most salient ornithological features are its colonies of rock-birds and gulls which, though numbering among them but few species, occur in the aggregate in tens of thousands. The herring-gull (*Larus argentatus*) occurs in small numbers, being greatly exceeded by the lesser black-backed gull (*Larus fuscus*). These two species nest chiefly on the upper western slopes of the Craig, between the cairn on its summit and the pillared crags. They form their large nests of such plants as they find most readily at hand. The nests are usually placed under the shelter of a block of rock or the angles formed by two of the sides of neighbouring pillars, like an open book, and are unprotected towards the sea. They begin laying about the middle of May. These gulls are omnivorous feeders, and are credited with doing considerable harm to the rock-loving species. The kittiwake gull (*Rissa tridactyla*) unlike the two preceding species is strictly a maritime bird, and its nest is placed in the ledges of the precipices overlooking the sea. Thousands of kittiwakes nest on the Craig. If, after landing at the jetty, the visitor passes to the right hand, he will shortly find himself under tremendous precipices, at this point chiefly tenanted at the bottom by the beautiful kittiwakes. The cliffs are occupied from about fifteen feet from the ground, and thence upwards, reaching the summit at some parts, every little jutting piece of rock has its nest, and every rocky platform several. Only a few inches for the groundwork of a nest are necessary to ensure the occupation of a ledge. Nearly all the nests I have seen have been composed of the bladder and red campions. On these nests, their pure white and pearly-grey forms beautifully relieved against the grey rocks, sit the kittiwakes, comparatively heedless of intrusion. A too near approach will send them off with a querulous repetition of their trivial name—kittiwake, kittiwake!

This species is about the latest of the rock-birds frequenting the Craig to begin laying. One year recently, on the 3rd of June, in a number of nests but one egg was found. On a previous visit on the same date a fair start had been made. Its eggs are more varied in ground colour and markings than its congeners, and many of the clutches are indeed very beautiful. It lingers at its nesting haunts till the end of August, by which time some of its neighbours are on their way to winter quarters.

A group of oceanic birds which are rock-breeders now calls for mention. The first is the razor-bill (*Alca torda*) which, like the guillemot next to be referred to, swims and dives with great ease, and offers capital sport as some ardent gunners in Clyde waters very well know. In more northern localities the razor-bill is migratory, but here it is found all the year round. The wings in this group are used for propulsion under water, and as the birds are somewhat confiding their evolutions under water can be watched where the waters are clear. According to the light-keepers they appear around their nesting haunts early in March in small companies, gradually increasing in numbers until the middle or end of May, when laying begins. The razor-bill lays a single large egg, but neither in form nor colour does it equal the beauty of the egg of the guillemot. The razor-bill further is sometimes found on rocky places on the western slopes of the Craig. Mr. Seebohm, in his posthumously published work on the *Eggs of British Birds* (1896), says that "ledges are shunned. The razor-bill must have a hole, if one can possibly be obtained." We find it, however, on the Craig on the precipices, near their summits, literally "cheek-by-jowl" with their congeners, the guillemots. This species suffers greatly in time of storms in winter, and the shore is often strewn with the dead, possibly, as the late Dr. Robertson of Millport suggested, from emaciation and starvation, following on the disappearance of the small fry and other fishes after heavy gales. A great disparity in the relative numbers of the razor-bill and guillemot has been noticed in Clyde waters in the present year (1900), the latter greatly outnumbering the former.

The guillemot (*Uria troile*) occurs in great numbers and affects the ledges on the cliffs. Its egg rests on the rock ledges with no preparation whatever in the shape of a nest, and I have seen eggs placed in situations at an angle from the horizontal which

seemed to imperil their safety. To watch the parent bird working an egg under it with the aid of its bill when so placed is somewhat exciting. As a matter of fact one is startled from time to time to hear an egg smashing in its fall from the cliff, and every steamboat excursion round the Craig, with its attendant gun firing to raise the birds, is answerable for the destruction of many eggs during the nesting season. The eggs of this species are remarkable for their great size, for the beauty of their ground colour, the boldness of their markings and the varied manner of their distribution. They are of an elegant pyriform shape.

If visitors to the Craig go up to the cairn on the summit by the path that passes the castle they will see a great deal of the Ailsa cock or puffin (*Fratercula arctica*). This member of the auk family differs in some respects in its habits from the two last-named species, and also in its appearance, which is somewhat droll. It never falls to the guns of sportsmen in the upper waters of the estuary in winter when the razor-bill and guillemot are familiar enough. According to the light-keepers it arrives from the 10th to the 15th of April. It departs in August, and by the end of that month scarcely a puffin is to be seen. Throughout the summer the air is full of them. They are much more given to exercising themselves on the wing than their congeners, and as they nest all over the sides of the Craig, but not on the cliffs, they are constantly under observation. They often admit of a close approach, but when the spectator comes too near for their taste, they launch into space and fly away with great rapidity. They go off out to sea, and often seem to fly for the sake of flying. Suitable portions of the Craig are in great part riddled with their nesting holes. Any natural crevice is readily availed of, but in the absence of such, little difficulty appears to be met with in excavating holes. The ground is very open and loamy, and yields readily to the exertions of the powerful little excavators. Whether the hole be long or short, deep or shallow, concerns them not at all, and the number of exits and entrances is likewise a matter of indifference. The island is all over a huge talus slope, and this obtains even where vegetation is rank. Holes are in consequence numerous up to near the top, and even from the cairn which marks its summit (1114 feet) I have seen its egg taken. There is really little or no attempt at nest-making, although fragments of

dead brake-fern are often in the bottom of the holes where the eggs are laid. This is solitary, in size and whiteness somewhat resembling the egg of the common fowl, but it has underlying delicate violet markings.

The most impressive feature in the ornis of the Craig is the colony of gannets (*Sula bassana*). The great size of these birds, their power of flight, the purity of their plumage, their constantly uttered harsh calls, their great numbers and the manner in which they are massed together on the precipices, all contribute to the impression on the spectator. At some points they nest at no great elevation on the cliffs, but from these comparatively low situations they continue upwards in increasing numbers till the summits of the great pillars are reached, and here the visitor can get among them. The majority of the birds are in full plumage, but a fairly large number show slight traces of immaturity. Brown birds are quite rare as far as I have seen. The nest is a large structure, and though this is usually stated to be made of sea-weed, the rank flowering-plants near its nesting site are freely drawn upon. A single egg with a chalky-white exterior is laid. The young, when newly hatched, are black toad-like objects, but they soon become covered with long white down. During the course of the change from this covering to the brown plumage of immaturity, the birds present a remarkable appearance. The neck and head are the last parts to lose the down, and in this state, with the body and wings covered with brown feathers, they appear as if decorated with judges' wigs. A bird of powerful wing and characteristic flight, it can be recognised at a great distance, and forms a splendid adjunct to the bird-life of the estuary.

There is no recent evidence that I am aware of, of the cormorant or shag nesting on the Craig, and the black guillemot has never occupied a secure place in its avi-fauna. It seems not improbable that it may have nested sparingly in former years, but at present it is either absent or overlooked.

In autumn the bottom of the cliffs may almost be said to be strewn with dead birds. The sight is a pathetic one and the stench memorable, but a high mortality is such a regular accompaniment of congested communities as perhaps scarcely to deserve to be remarked upon.

REPTILIA.—The slow-worm or blind-worm (*Anguis fragilis*) is a well-known inhabitant of Ailsa, and several were seen by us on 22nd May, 1895 (A. V.). It is said to be much scarcer within recent years, and the rats are charged with destroying it (B. XV. 89).

PISCES.—Prof. Bell Todd reports (A. VIII.) that the dog-fish, *Acanthias vulgaris*, seems to be very common off the south-east side of the island, it being caught in a short period of time by using the wing of a sparrow as bait.

INVERTEBRATA.

MOLLUSCA.—The most abundant marine shell seems to be *Trochus cinerarius* (B. XXX.), and there is a prize for the conchologist in the white-lipped variety of the common periwinkle (*Littorina littorea*), but he must dig for it amongst the coarse gravel of the east shore to the depth of three or four feet (A. II.). Of land-molluscs we have collected the common field-slug (*Agriolimax agrestis*) and also *Helix rotundata*, *H. aspersa*, *H. nemoralis*, *H. arbustorum* and *Clausilia rugosa*. *A. agrestis* and *H. arbustorum* were named by the Rev. G. A. Frank Knight, M.A., the first-mentioned provisionally as the specimen had been badly preserved, and the other species are on the authority of Mr. John Smith. To the above species we add on the authority of Mr. Thos. Scott, F.L.S., **Hyalinia alliaria* and **Pupa cylindracea* (B. XXVII. 157); and propose in our account of the invertebrate fauna of Ailsa to include in the lists any species which Mr. Scott has noted in the paper above referred to, in addition to our own records, so that this account may be as complete as possible. Mr. Scott's records are distinguished by an * prefixed to the names of the species, as above.

INSECTA.—The members of our Entomological section who visited Ailsa with the Society on 24th May, 1900, made a considerable addition to our knowledge of the insect-fauna of the island, as the following lists show. Except where otherwise stated the records apply to the above date, and we are indebted for them to Messrs. A. Ross, R. Henderson, J. E. Murphy and H. W. Wilson.

HYMENOPTERA.

Bombus terrestris, L. *Strongylogaster cingulatus*, F.
* *Homalomyia canicularis*, L.¹

On 3rd June, 1893, Mr. Smith noted a black ant (? species).

¹ May not this be *H. canicularis*, L., a dipteran?

LEPIDOPTERA.

- | | |
|--|--|
| Pieris brassicæ, L. | Camptogramma bilineata, L. (<i>vide</i> |
| Vanessa urticæ, L. | J. Smith, 3rd June, 1893). |
| Nemeophila plantaginis, L. | Eupoecilia angustana, Hb. |
| (<i>vide</i> J. Smith, 3rd June, 1893). | Several white butterflies seen at a |
| Habrostola tripartita, Hufn. (<i>vide</i> | distance (<i>vide</i> J. Smith, 3rd |
| J. Smith, 3rd June, 1893). | June, 1893). |
| Eupithecia venosata, Fb. | |

DIPTERA.

- | | |
|------------------------------|--------------------------------|
| Dilophus febrilis, L. | Lucilia cornicina, Fab. |
| Bibio laniger, Mg. | Calliphora erythrocephala, Mg. |
| Empeda nubila, Schum. | Onesia sepulchralis, Mg. |
| Rhypholophus nodulosus, Mcq. | Pegomyia bicolor, Wied. |
| Trichocera hiemalis, Deg. | Scatophaga stercoraria, L. |
| Empis trigramma, Mg. | Nemopoda cylindrica, Fab. |
| Platychirus manicatus, Mg. | Psila rosæ, Fab. |
| P. albimanus, F. | |

COLEOPTERA.

- | | |
|-------------------------------|--------------------------------|
| Pterostichus niger, Schall. | Subcoccinella vigintiquatuor- |
| P. nigrita, F. | punctata, L. |
| Calathus melanocephalus, L. | Coccinella undecimpunctata, L. |
| Staphylinus stercorarius, Ol. | C. septempunctata, L. |
| Silpha rugosa, L. | Athous hæmorrhoidalis, F. |
| S. thoracica, L. | Dolopius marginatus, L. |

Of *S. 24-punctata* Mr. Anderson Fergusson says that it "has, so far as I know, not hitherto been recorded for 'Clyde.'" Mr. Fergusson has recorded from Ailsa the following additional species, *Byrrhus pilula*, L., *Otiorrhynchus blandus*, Gyll., and *O. rugifrons*, Gyll. (B. VIII.); and Mr. Scott records **Melanophthalma fuscula*, Humm., **Agabus bipustulatus*, L., and **Philhydrus melanocephalus*, Oliv.

MYRIOPODA.—Millipedes are numerous, but the only species identified was *Julus niger*, Leach, which Mr. Ross collected, and Mr. R. I. Pocock named for him.

ARACHNIDA.—Of the Araneidea, on our visit on 3rd June, 1893, Mr. Frank L. Grant, M.A., obtained the following three spiders:—*Textrix lycosina*, Bl., *T. denticulata*, Oliv., and *Xysticus pini*, Hahn. (A. III.). The common garden-spider (*Epeïra diadema*, C.L.K.) grows to a large size, and one of its habitats is the recesses of the Water Cave (B. XV. 62).

CRUSTACEA.—The rough tidal rocks are coated with "acorn-shells" (*Balanus balanoides*, L.), and the wood-louse or sclater

(*Oniscus asellus*, L.) swarms under the stones on the upper beaches. Mr. Scott's further records are—**Porcellio scaber*, Latreille, **Cyclops bisetosus*, Rehberg, **Moraria Anderson-Smithi*, T. and A. Scott, **Alona rustica*, T. Scott, and **Chydorus sphaericus*, Müller.

VEGETABILIA.

PHAENOGAMIA AND FILICES.—On landing the flowers that first attract our attention are the daisies (*Bellis perennis*). They are exceedingly dwarfed and small. The prevailing flower is certainly the sea bladder-campion (*Silene maritima*), and we find it blooming often in beautiful clumps all over the rock. The next one in point of attraction is the "blue-bell of the woods" (*Scilla nutans*), about the last place one would think of going to look for it. It is not only abundant, but thrives well, some of the plants measuring three feet in length. From the beach we detected patches of red on the brae-face, and these turned out to be clumps of the red campion (*Lychnis diurna*). The common nettle (*Urtica dioica*) is abundant everywhere, and the "sourrock" (*Rumex Acetosa*) is common in many parts. We only find five shore plants, and this is astonishing on a maritime island, but is explained by the fact that there is no habitat for more, there being neither mud, sand, nor fine gravel. At the south end grows the tree-mallow (*Lavatera arborea*) up among the cliffs, and we find it in abundance and in beautiful flower. A number of elders (*Sambucus nigra*) are seen in flower; these form the only "forest" that the island can boast of, and along with a few honey-suckles are the only woody-stemmed plants we observe. Sixty-three species of plants were noted (3rd June, 1893) belonging to fifty-seven genera, the proportional number of genera to species being remarkable (A. I. and B. XXVIII.)

List of plants made on 3rd June, 1893, and on 24th May, 1900.
Fl. = plants in flower; Fr. = plants in fruit.

Ranunculus Flammula, Linn.—At Garry Loch.

R. repens, Linn.—Fl.

R. bulbosus, Linn.—Fl., above the shore-cliffs.

Caltha palustris, Linn.—Fl., at Garry Loch and on wet rock.

Fumaria capreolata, Linn.—Fl., scarce.

Corydalis claviculata, DC.—Fl., rare, cliffs south-east corner.

Cardamine hirsuta, Linn.—Fl., fr., scarce.

Cochlearia officinalis, Linn.—Fl., fr., common.

Sisymbrium Thaliana, Hook.—Frequent on old gravel beach.

- Brassica monensis*, Huds.—Fl., frequent at south end.
Polygala vulgaris, Linn.—Fl., common.
Silene maritima, With.—Fl., abundant all over rock.
Lychnis dioica, Linn.—Fl., common, plants large and fleshy near the shore.
Cerastium triviale, Link.—Fl., rare.
Stellaria media, Cyr.—Fl., scarce.
Sagina procumbens, Linn.—Fl., fr., abundant all over.
Spergularia marina, Leb.—Fl., on old sea-cliffs.
Montia fontana, Linn.—Fl., at the loch.
Lavatera arborea, Linn.—Fl., south end, on the rocks.
Erodium cicutarium, L'Hérit.—Fl., scarce.
Vicia lathyroides, Linn.—Fl., scarce.
Rubus fruticosus, Linn.—Rare.
Fragaria vesca, Linn.—Fl., scarce.
Potentilla Tormentilla, Neck.—Fl., scarce.
Cotyledon Umbilicus, Linn.—Fl., common.
Sedum anglicum, Huds.—Fl., common.
Callitriche verna, Linn.—At Garry Loch.
Hedera Helix, Linn.—Scarce, old sea-cliffs.
Sambucus nigra, Linn.—Fl., frequent at south-east corner.
Lonicera Periclymenum, Linn.—Rare, old sea-cliffs.
Galium saxatile, Linn.—Fl., common.
G. Aparine, Linn.—Scarce.
Scabiosa succisa, Linn.—Fl., scarce.
Bellis perennis, Linn.—Fl., frequent, small.
Matricaria inodora, Linn.—Fl., near Lighthouse.
Artemisia vulgaris, Linn.—Near Lighthouse.
Senecio Jacobæa, Linn.—Common, a few in fl.
Carlina vulgaris, Linn.—? Not in fl.
Arctium minus, Bernh.—Frequent.
Carduus crispus, Linn.—Fl., south-east side.
Cnicus lanceolatus, Willd.—Scarce.
Hypochoeris radicata, Linn.—Fl., frequent.
Taraxacum officinale, Web.—Fl., rare.
Sonchus oleraceus, Linn.—Rare.
Jasione montana, Linn.—Stunted and dwarfed; named by Mr. A. Somerville, F.L.S., from specimen sent him by Mr. J. Cairns, 24th May, 1900.
Calluna vulgaris, Salisb.—Dwarfed, scarce.
Erica cinerea, Linn.—Common, a few in fl.
Armeria maritima, Willd.—Fl., common at north end.
Lycopsis arvensis, Linn.—Fl., scarce.
Myosotis arvensis, Lam.—Fl., frequent.
Veronica agrestis, Linn.—Fl., scarce.
Euphrasia officinalis, Linn.—Fl., scarce.
Teucrium Scorodonia, Linn.—Very common all over.

- Plantago maritima*, Linn.—Fl., old sea-cliffs, scarce.
P. Coronopus, Linn.—Fl., old sea-cliffs and gravel beach.
Rumex crispus, Linn.—Frequent above the shore.
R. Acetosa, Linn.—Fl., very common.
R. Acetosella, Linn.—Fl., rare.
Urtica dioica, Linn.—Abundant all over.
U. urens, Linn.—Scarce; at south end.
Scilla nutans, Lin.—Fr., fl., abundant, and 3 feet long at places.
Juncus squarrosus, Linn.—At Garry Loch.
Luzula campestris, DC.—Fr., rare.
Anthoxanthum odoratum, Linn.—Fr., scarce.
Aira præcox, Linn.—Fr., all over the island.
Holcus mollis, Linn.—Fl., frequent.
Poa annua, Linn.—Fl., scarce.
Festuca ovina, Linn.—Fl., frequent.
Pteris aquilina, Linn.—Common, all over rock.
Asplenium Adiantum-nigrum, Linn.—Very rare.
A. marinum, Linn.—Very rare.
Polypodium vulgare, Linn.—Scarce, small.

Mrs. Fingland (A. VI.) writes:—Anyone who visits Ailsa Craig expecting to find there a second, if a smaller, Arran will be quickly disillusioned. The extreme rankness of the vegetation first attracts attention; a closer look discloses the fact that the species are few and common-place. If Arran is a veritable paradise for plants, Ailsa, especially in the neighbourhood of the landing-place, resembles rather the river-bank near a small manufacturing town. . . . The usual explanation offered for the rankness of the vegetation is the presence of the sea-birds in such immense numbers; but what can account for the paucity of species? . . . Is the reason in any small degree geological? . . . The nearest approach to Ailsa geologically that I can find is the tiny point of granite called Rockall, 250 feet in circumference and rising 70 feet above sea-level, which stands on a sandbank in the North Atlantic 160 geographical miles west of St. Kilda. Is this bank (about 150 miles long and 50 miles broad within the 200-fathom contour-line) the debris of some lofty granite mountain-range of which this lonely rock is the only remaining fragment, a range belonging to some worn-down palæozoic continent, as Ailsa is believed to belong to old Silurian land? Now if Ailsa belongs to the eruptive area of the south of Scotland does its flora in any degree resemble that of Merrick and Cairnsmore? And if, as is believed, the granite of Arran has

some affinity with that of the Mourne mountains, is there any similarity in the flora of the two districts? I do not know—I merely throw out the suggestion. The ice of the glacial period would swathe all these areas; it cannot be invoked in this case of difficulty as a *deus ex machinâ*. When milder conditions again prevailed what influence scattered *Arctostaphylos* on the Holy Isle and left Ailsa poor and bare?

DIATOMACEÆ.—Mr. John Paterson (Rutherglen) made a collection of Diatoms on our last visit (24th May, 1900), and with the much valued assistance of Mr. Thomas Comber, F.L.S., the following thirty-eight species and six varieties have been made out and named.

FRESH-WATER.

<i>Cymbella affinis</i> , Ktz.	<i>Microneis minutissima</i> , Cl.
<i>C. cistula</i> , Van Heurck.	<i>Epithemia turgida</i> , Ktz.
<i>Caloneis fasciata</i> , Cl.	<i>E. zebra</i> , Ktz.
<i>Diploneis ovalis</i> , Cl.	<i>Eunotia exigua</i> , Grun.
<i>Navicula lanceolata</i> , Ktz.	<i>E. gracilis</i> , Sm.
<i>Pinnularia subcapitata</i> , Greg.	<i>Synedra lunaris</i> , Ehr. (short form).
<i>P. borealis</i> , Ehr.	<i>S. lunaris</i> , var. <i>subarcuata</i> , Næg.
<i>P. borealis</i> , var. <i>scalaris</i> , Grun.	<i>Fragilaria virescens</i> , Ralfs.
<i>P. gracillima</i> , Greg.	<i>Odontidium hiemale</i> , Ktz.
<i>P. hemiptera</i> , Bréb.	<i>Denticula inflata</i> , Sm.
<i>P. interrupta</i> , Sm.	<i>Tabellaria flocculosa</i> , Ktz.
<i>P. lata</i> , Sm.	<i>Surirella splendida</i> , Ehr., var.
<i>P. major</i> , Rabh.	<i>linearis</i> , Sm.
<i>P. viridis</i> , Ehr.	<i>Nitzschia denticula</i> , Grun.
<i>P. viridis</i> , var. <i>fallax</i> , Grun.	<i>N. sinuata</i> , Grun.
<i>Gomphonema montanum</i> , Schum.,	<i>Melosira Dickiei</i> , Ktz.
var. <i>subclavatum</i> , Grun.	<i>Cyclotella Kutzingiana</i> , Thw.

The above were all obtained in pools and ditches. The most uncommon of them, viz., *Pinnularia borealis*, var. *scalaris*, was also obtained as a pure gathering from a moist crevice in the cliffs.

MARINE.

<i>Trachyneis aspera</i> , Cl., var.	<i>Grammatophora marina</i> , Ktz.
<i>pulchella</i> , Sm.	<i>G. serpentina</i> , Ehr.
<i>Caloneis amphisbæna</i> , Cl.	<i>Rhabdonema Adriaticum</i> , Ktz.
<i>Rhoicosphenia curvata</i> , Grun.	<i>R. arcuatum</i> , Ktz.
<i>Cocconeis scutellum</i> , Ehr.	<i>Cyclotella striata</i> , Grun.
<i>Eucocconeis pseudomarginata</i> , Cl.	<i>Coscinodiscus decipiens</i> , Grun.
<i>Synedra Gaillonii</i> , Ehr.	

APPENDIX A.—PROCEEDINGS.

- I. 7th June, 1893.—Exhibition of Birds' Eggs, etc., and Report of Ornithological Excursion of 3rd June, 1893.
- II. 5th July, 1893.—Exhibition of variety of *Littorina littorea*, L., by Mr. James Steel.
- III. 2nd August, 1893.—Exhibition of Spiders, including Ailsa Craig specimens, by Mr. Frank L. Grant, M.A.
- IV. 6th September, 1893.—Exhibition of Photographs by Mr. James Mitchell.
- V. 5th June, 1895.—Exhibition of Slow-worm (*Anguis fragilis*, L.) and examples of the rock (syenite) by Mr. Hugh Boyd Watt.
- VI. 1st July, 1896.—Notes on Ailsa Craig by Mrs. S. Fingland, illustrated by a series of photographs.
- VII. 5th August, 1896.—Glimpses of the Summer Bird-life of Ailsa Craig, Inch Moan, the Bass and Isle of May (with specimens and photographs) by Mr. Hugh Boyd Watt.
- VIII. 12th January, 1900.—Notes on Ailsa Craig by Prof. Geo. Bell Todd, M.B.
- IX. 6th July, 1900.—Report of Society Excursion of 24th May, 1900.
- X. 6th July, 1900.—Further Notes on Ailsa Craig by Members.

APPENDIX B.—REFERENCES.

- I. ABERCRUMMIE, WILLIAM. *Carrick in 1696*. Original not seen: quoted in Paterson's *History of Ayr and Wigton* (1864) II. p. 169; Robertson's *Historic Ayrshire* (1891) I. p. 86; and *Annals of Scot. Nat. Hist.* (1898) p. 112. Mentions Ailsa and albanacks or Ailsa Cocks, tarnathans, solan-geese, wild doves and conies.
- II. ANDERSON, THOMAS. See Gray, Robert.
- III. BALFOUR, J. H. "Account of a Botanical Excursion to Ailsa Craig in July, 1844." *The Phytologist: a Popular Botanical Miscellany* (1845) II. pp. 257-65. Contains list of 79 species of phanerogams, 7 ferns, 14 mosses, 4 hepaticæ, 19 lichens and 14 sea-weeds = 147 species in all collected. List is reprinted in Mr. Lawson's book, *infra* XV.
- IV. BATTERS, E. A. L. See Murray, John.
- V. BRERETON, Sir WILLIAM. *Travels in Holland, the United Provinces, England, Scotland and Ireland in 1634-5* (1844) p. 118. Mentions "Ellsey . . . abundance of fowl and solemne-geese . . . and two earies of goose-hawks." (Quoted by Landsborough and Lawson as Brewster).
- VI. BRYCE, JAMES. *The Geology of Arran and the other Clyde Islands, with an Account of the Botany, Natural History and Antiquities, Notices of the Scenery and an Itinerary of the Routes*, 4th ed. (1872) pp. 353-4. Geological notes; and Mr. W. Newton MacCartney mentioned as having collected 109 flowering plants, including 14 grasses, on Ailsa. See XI. *infra*.

- VII. CAMPBELL, J. MACNAUGHT. "On the Appearance of the Brown Rat (*Mus decumanus*) on Ailsa Craig." *Annals of Scot. Nat. Hist.* (1892) pp. 132-4.
- VIII. FERGUSSON, ANDERSON. "Coleoptera from Ailsa Craig." *Proc. Nat. Hist. Socy. Glasgow* (1898) V. (N.S.) p. 295. Five species named and shown.
- IX. GEOLOGICAL SURVEY, SCOTLAND, MEMOIRS OF. *Explanation of Sheet 7, Ayrshire: South-Western District* (1869) pp. 12 and 15-6 on Ailsa.
- X. GRAY, ROBERT and ANDERSON, THOMAS. "On the Birds of Ayrshire and Wigtownshire." *Proc. Nat. Hist. Socy. Glasgow* (1869) I. pp. 269-324. Contains many Ailsa references, and mentions the rock-dove, ringed guillemot, common cormorant, shag, common gull and storm-petrel as breeding birds in addition to those named on pp. 142-5 ante. (Also published separately with illustration of Ailsa; not seen.)
- XI. GRAY, ROBERT. *The Birds of the West of Scotland, including the Outer Hebrides* (1871). Gray also has Ailsa notes in his "Birds of Arran" contained in VI. *supra* pp. 288-312.
- XII. KEARTON, R. *British Birds' Nests; How, Where and When to find and identify them, Illustrated from Photographs by C. Kearton of Nests in their natural situations and surroundings* (1895). Contains several Ailsa photographs, including one of the old nesting-place of the storm-petrel.
- XIII. KEARTON, R. *With Nature and a Camera, Illustrated from Photographs by C. Kearton* (1898). Notes on visit to Ailsa pp. 332-6.
- XIV. LANDSBOROUGH, Rev. D. *Excursions to Arran, Ailsa Craig and the two Cumbraes, with reference to the Natural History of these Islands.* 2nd Series (1852) pp. 95-136 give an account of a short visit to Ailsa.
- XV. LAWSON, Rev. R. *Ailsa Craig: its History and Natural History.* New Edition, enlarged (1895) pp. 1-90. Contains map, scale 6 inches to 1 mile, and illustrations: covers the whole ground—natural history is a compilation.
- XVI. MACCARTNEY, W. NEWTON. "On the Geology of Ailsa Craig." *Proc. Nat. Hist. Socy. Glasgow* (1868) I. pp. 151-9.
- XVII. MACCULLOCH, JOHN. *The Highlands and Western Islands of Scotland, containing descriptions of their Scenery and Antiquities . . . founded on a Series of Annual Journeys between the years 1811 and 1821, in 4 Vols.* (1824). II. pp. 53-60 contain fine and accurate description of Ailsa; chief flowers *Lychnis dioica* and *Silene amœna*, "like a brilliant garden;" goats, rabbits, and some birds mentioned.
- XVIII. MARTIN, MARTIN. *A Description of the Western Islands of Scotland, circa 1695* (1884 Reprint). Pp. 227-8 Ailsa; cod and ling fishing mentioned; coulterneb are by the fishers called albanich—"which in the ancient Irish language signifies Scotsmen."
- XIX. MILL, HUGH ROBERT. "Configuration of the Clyde Sea-Area." *Scottish Geographical Magazine* (1887) III. pp. 15-21. Contains map of area and a brief note on Ailsa (p. 18).

- XX. MONIPENNIE, JOHN (*circa* 1597). *The Abridgement or Summarie of the Scots Chronicles, with a Short Description, etc., etc.* (1820). Notice of Ailsa, page 175.
- XXI. MONRO, DONALD (*circa* 1549). *A Description of the Western Isles of Scotland called Hebrides* (1884 Reprint). Short notice of "Elsay;" cod, ling and white fishing mentioned, p. 14.
- XXII. MURRAY, JOHN. "The Clyde Sea-Area, with Map." BATTERS, E. A. L. "Hand-List of the Algae." Reprinted from the *Journal of Botany* for 1891. Pp. 1-25 contain a few Ailsa records: includes a list of papers published on the Clyde Sea-Area.
- XXIII. PENNANT, THOMAS. *A Tour in Scotland and a Voyage to the Hebrides, 1772*. Part I. 2nd ed. (1776) pp. 215-8 contain account of a visit to Ailsa on 25th June, 1772, naming goats, rabbits, some birds (including sea-pies nesting, also hooded crows), and three "reptiles" (molluscs); plate 14 gives two views of the "crag of Ailsa."
- XXIV. REPORTS ON THE MOVEMENT AND OCCURRENCE OF BIRDS IN SCOTLAND. *Annals of Scot. Nat. Hist.* (1894-5-6-7). Returns of Migratory Birds from Ailsa for four years, by Mr. W. A. Tulloch, Light-keeper.
- XXV. ROSE, GEORGE. "Bird-nesting and Egg-collecting." *Annals of Glenfield Ramblers' Society, Kilmarnock* (1898). Pp. 47-50 contain account of a visit to Ailsa.
- XXVI. SCOTT, THOMAS. "The Invertebrate Fauna of the Inland Waters of Scotland." Part VIII. *Sixteenth Annual Report of the Fishery Board for Scotland, 1897* (1898). Paragraph on Garry Loch p. 250: records included in next entry.
- XXVII. SCOTT, THOMAS. "Notes on the Micro-Fauna of Ailsa Craig, Firth of Clyde." *Trans. Nat. Hist. Socy. Glasgow* (1898). V. (N.S.) pp. 153-8 contain account of two short visits and observations; 5 Mollusca and one var., 6 Crustacea and 8 Insecta named in list.
- XXVIII. SMITH, JOHN. "Ailsa Craig." *Ardrossan and Saltcoats Herald* (8th and 15th December, 1893). Narrative of our visit on 3rd June, 1893.
- XXIX. STATISTICAL ACCOUNT OF SCOTLAND (1791). I. p. 104, under Ballantrae, mentions Ailsa as uninhabited; names sea-fowl, solan-geese, rabbits and goats. N.B.—In the new *Statistical Account* (1845) is no natural history from Ailsa.
- XXX. STEEL, JAMES. "Report on a visit made to Ailsa Craig on 5th June, 1884." *Proc. Nat. Hist. Socy. Glasgow* (1886) I. (N.S.) p. XXX.
- XXXI. THOMPSON, WILLIAM. *The Natural History of Ireland* (1849 *et. seq.*). Contains occasional references to Ailsa; little auks seen 19th May, 1849.
- XXXII. WALKER, THEODORE C. "Remarks on the Birds of Ailsa Craig." *The Zoologist* (1868) XXVI. pp. 1365-73. Visit in June, 1866; great black-backed gull and shag found nesting in addition to species named on pp. 142-5 *ante*; also storm-petrel reported.

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- Page 25, line 26, for "specimens" read "species."
,, 36, lines 20 and 23, for "Ann" read "Anne."
,, 42, line 35, for "Braidland" read "Baidland."
,, 43, ,, 20, ,, ,, ,, ,,
,, 95, ,, 8, ,, "Gorthly" ,, "Gorthy."
,, 113, ,, 7, ,, "*Trichus fasciatus*" read "*Cetonia floricola*."

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